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INDIANA UTILITY REGULATORY COMMISSION

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF THE CITY OF ANDERSON, INDIANA

(1) FOR AUTHORITY AND APPROVAL TO INCREASE RATES AND CHARGES FOR WATER SERVICE, INCLUDING APPROVAL OF NEW SCHEDULE(S) OF RATES AND CHARGES FOR WATER SERVICE, AND

(2) FOR AUTHORITY AND APPROVAL TO ISSUE BONDS, NOTES, OR OTHER OBLIGATIONS OF INDEBTEDNESS

CAUSE NO. 44510

PREFILED DIRECT TESTIMONY AND EXHIBITS

OF

ROBERT E. CURRY

(PETITIONERS EXHIBITS REC AND REC-1)

By: ______________________________

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Water Utility

CERTIFICATE OF SERVICE

Served upon the following by mail and by electronic transmission on July 2, 2014:

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1. Q PLEASE STATE YOUR NAME AND ADDRESS.

A My name is Robert E. Curry. My business address is 110 Commerce Drive, Danville, Indiana 46122.

2. Q PLEASE TELL THE COMMISSION YOUR PROFESSION AND WITH WHOM YOU ARE EMPLOYED.

A I am a Registered Professional Engineer and Vice President of the firm of Curry & Associates, Inc., Consulting Engineers and Architects, Danville, Indiana.

3. Q PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL STATUS WHICH IMPACT YOUR OPINIONS IN THIS CAUSE.

A I graduated from Purdue University in 1969 with a B.S. Degree in Engineering Technology. In 1977, I received an MBA from Butler University. In 1973, I became registered as a professional engineer in the state of Indiana, and in 1981, I became registered in the state of Ohio.

4. Q PLEASE DESCRIBE YOUR OWN PROFESSIONAL EXPERIENCE AND THAT OF YOUR FIRM WHICH MAY BE RELEVANT TO THE ISSUES IN THIS CASE.

A Early in my career, I was associated with the consulting engineering firm of Henry B. Steeg & Associates and was primarily involved in waterworks design and inspection. Thereafter, I was employed by the Indiana Department of Natural Resources in various capacities, including Sanitary Design Engineer; Chief Engineer of Operations and

Construction; and Chief Engineer of Planning and Design. In 1977 I started Robert E. Curry & Associates, Inc. Our company has served as design engineer and construction inspectors on numerous water and wastewater projects in Indiana. I personally have designed and worked on projects for numerous municipalities, rural utilities, investor-owned utilities and conservancy districts. Our firm is regularly retained to review various problems facing our clients and thereafter to recommend engineering solutions.

5. Q HAVE YOU TESTIFIED PREVIOUSLY BEFORE THE INDIANA UTILITY REGULATORY COMMISSION ON OTHER WATERWORKS PROJECTS ON WHICH YOUR FIRM WAS THE CONSULTING ENGINEER?

A Yes.

6. Q HAVE YOU PREVIOUSLY WORKED FOR AND TESTIFIED ON BEHALF OF CITY OF ANDERSON, INDIANA ("ANDERSON")?

A Yes. I have designed facilities for City of Anderson which cover water supply, water treatment, water transmission and distribution and water storage for the past 30-years. Further, I have testified on the City of Anderson's behalf before this Commission on various occasions.

7. Q ARE YOU A MEMBER OF ANY PROFESSIONAL ORGANIZATIONS?

A Yes. I am a member of the American Waterworks Association, the National Society of Professional Engineers, the Indiana Water & Wastewater Association, the Indiana Rural Waterworks Association, and the Water Environment Federation.

8. Q WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A I will provide a description of the City of Anderson Waterworks and summarize the projects that the City desires to implement and complete. To support this description, our firm has prepared a PRELIMINARY ENGINEERING REPORT, under my direction and supervision which is attached as Petitioner's Exhibit REC-1.

9. Q DESCRIBE THE PETITIONER AND ITS SERVICE TERRITORY.

A The City of Anderson is a municipal water utility that provides potable water service to customers in various municipal areas within the City Limits of the City of Anderson. Also, the City of Anderson sells a small quantity of water outside the Anderson City Limits. The customer base is residential, institutional, commercial and industrial. Currently, the City of Anderson is actively pursuing increased commercial and industrial growth.

10. Q MR. CURRY, PLEASE PROVIDE A GENERAL OVERVIEW DESCRIPTION OF THE CURRENT FACILITIES OWNED AND OPERATED BY THE PETITIONER.

A The City of Anderson Waterworks currently owns and operates three (3) water supply well fields known as the Lafayette Well Field, the Ranney Well Field and the Norton Well Field. The Lafayette well field was originally constructed in the late 1960's and consists of eight (8) gravel pack water supply wells. One additional well has been added to the original wells. The Ranney Well Field was originally constructed in the 1947 and consists of both radial horizontal collector wells and gravel pack wells. Certain of the collector wells and certain gravel pack wells have been abandoned in past years. The Norton Well Field consists of two (2) unconsolidated or rock wells, approximately 300 feet deep. These wells were constructed in approximately 1910 and pump to the Wheeler Avenue Water Treatment Plant. A more detailed description of the City of Anderson water supply is provided in a Preliminary Engineering Report prepared by our firm.

The City of Anderson operates two water treatment plants known as the Lafayette Water Treatment Plant and the Wheeler Avenue Water Treatment Plant. Both water treatment plants primarily function for the removal of iron and manganese. However, the Ranney Well Field plant has been determined to be ground water under the direct influence of surface water. Consequently, the Wheeler Water Plant is now classified as a surface water treatment plant. This determination by I.D.E.M. has required Anderson to install additional water treatment equipment and change their licensed operator status to a higher level (WT-5 license) to comply with the I.D.E.M. Regulations for Surface Water Treatment.

The Wheeler Avenue Water Treatment Plant was originally constructed in 1947 and its most recent renovation occurred in 1968.

The Lafayette Water Treatment Plant was constructed new in 1969 and no significant upgrades have been made to this water treatment plant. A more detailed description of the City of Anderson water treatment plants is provided in a Preliminary Engineering Report prepared by our firm.

The Lafayette Water Treatment Plant was originally rated at approximately 8,300,000 gallons per day and currently this water treatment plant has a safe operating capacity of approximately 5,000,000 gallons per day.

The Wheeler Avenue Water Treatment Plant was originally rated at approximately 9,800,000 gallons per day and currently this water treatment plant is capable of producing approximately 5,500,000 gallons per day. The capacity of this water treatment plant is limited by the volume of water produced by the water supply wells.

Operationally, the Lafayette Water Treatment Plant operates continuously and the Wheeler Avenue Water Treatment Plant produces all additional water needed to satisfy the distribution system water demand.

The City of Anderson has a very large water distribution system containing water mains of various materials ranging from cast iron, steel, PVC, asbestos- cement, prestress concrete, and ductile iron. The ages of the various existing water mains range from the time of origination of the water works up to current day installations. The distribution system has significant excessive water loss issues and extensive effort has been made to reduce water loss. The most significant cause of water loss appears to be small diameter (2" to 4") galvanized steel water mains installed shortly after World War II.

The City of Anderson has seven (7) elevated water storage tanks consisting of the following:

1.	Eighth Street Tank	500,000 gallons multi-column
2.	Cross Street Tank	500,000 gallons multi-column
3.	East 10th Street Tank	500,000 gallons multi-column
4.	Fairview Street Tank	1,000,000 gallons multi-column
5.	Columbus Avenue Tank	1,000,000 gallon multi-column
6.	Range Line Road Tank	1,000,000 gallon multi-column
7.	Park Road Tank	2,000,000 gallon composite

The 2,000,000 gallon capacity Park Road Tank is the most recent elevated water storage tank to be constructed at the City of Anderson. This tank floats on the southeastern portion of the water distribution system and provides water service to Flagship Industrial Park and to the new Nestles' Food Processing Plant.

11. Q Q. COULD YOU DESCRIBE HOW EACH WELL FIELD OPERATES WITH EACH WATER TREATMENT PLANT?

A Yes, the Lafayette Well Field provides raw water only to the Lafayette Water Treatment Plant and the Ranney and Norton Well Fields provide water only to the Wheeler Avenue Water Treatment Plant.

12. Q IS IT POSSIBLE TO DIRECT WATER FROM EITHER WELL FIELD TO EITHER WATER TREATMENT PLANT?

A No, these two water supply well fields and water treatment plants are located several miles apart and it would be financially impractical to move raw water from either well field to either water treatment plant.

13. Q ARE THERE ANY DISTINGUISHING CHARACTERISTICS BETWEEN THE WHEELER AVENUE WATER TREATMENT PLANT AND ITS RAW WATER SUPPLY AND THE LAFAYETTE WATER TREATMENT PLANT AND ITS RAW WATER SUPPLY?

A Yes, the Ranney Well Field primarily utilizes large diameter collector wells and the Lafayette Well Field is characterized by smaller diameter gravel pack wells. The Ranney Well Field contains shallow wells with a deep static water level and located along Killbuck Creek. Pumping the Ranney Wells induces flow from Killbuck Creek into the collector wells. This issue has been proven by monitoring water temperatures in the wells during pumping. The result is that water temperatures from raw water leaving the collector wells tends to change from their normal groundwater temperature to a temperature that more closely resembles water temperature in Killbuck Creek. The two Norton Wells are very deep (300 feet) wells terminating in a rock formation.

14. Q IS THERE ANY DIFFERENCE IN THE LOCATION TYPE OF LAND USE DEVELOPMENT IN THE AREA SURROUNDING THE RANNEY WELL FIELD AND THE LAFAYETTE WELL FIELD?

A Yes, the Ranney and Norton Well Fields are located in an aquifer along White River and Killbuck Creek near the center of the City of Anderson. The Ranney Wells are located within the flood plain area that typically floods each year. The raw water main from the Ranney Well and the Norton Well Field to the Wheeler Avenue Water Treatment Plant is located in the flood plain as well and routinely floods and is covered by flood water during flood periods and is inaccessible for repairs during flooding periods.

The Lafayette Well Field is located in a rural area on the northwest side of the City of Anderson. Generally, wells in the Lafayette Well Field are surrounded by farm fields containing corn, soy beans or hay. Wells in the Lafayette Well Field are in a sand and gravel aquifer and the ground elevation in the well field is substantially above the 100-year flood elevation. Consequently, flooding is never an issue in the Lafayette Well Field. Due to the higher ground elevation on the north side of the City of Anderson the wells in the Lafayette Well Field and raw water main from Lafayette Well Field to the water treatment plant are always accessible for ease of maintenance.

15. Q CONSIDERING YOUR UNDERSTANDING OF THE VARIABLES AFFECTING RAW WATER SUPPLY FOR THE CITY OF ANDERSON, DO YOU BELIEVE IMPROVEMENTS ARE NEEDED IN THE VERY NEAR TERM?

A Yes.

16. Q WHICH WELL FIELD WOULD YOU CONSIDER FOR IMPROVEMENTS FIRST AND WHY?

A I recommend that improvements be made to the Lafayette Well Field first because it will produce the most economical source of water to develop and provides the most dependability, reliability and maintainability for year-around operation. This well field has been confirmed, by a hydrogeologist, to contain a reliable daily water supply of 12,000,000 gallons per day.

17. Q IN VIEW OF THE AGE AND CONDITION OF ANDERSON'S LAFAYETTE WATER SUPPLY WELL FIELD, HAS THE CITY OF ANDERSON MADE ANY RECENT EFFORT TO VERIFY THEIR ACCESS TO A CONTINUED SUPPLY OF RAW WATER?

A Yes, the City of Anderson employed Layne Christensen Company to perform a hydrogeological study of the Lafayette Well Field. This hydrogeological study was completed in the summer of 2013 and a report was presented to the Anderson Board of Works. This report is based on pumping of existing wells in the Lafayette Well Field and monitoring exiting test and production wells. A computerized hydraulic model was made of the Lafayette Well Field. The completed hydrogeological report suggests the Lafayette Water Supply Well Field is capable of safely producing approximately 12,000,000 gallons per day of raw water. This report provided by Layne is provided as Appendix "B" to the Preliminary Engineering Report.

18. Q WHAT IS THE SIGNIFICANCE OF THE RESULTS OF THE HYDROGEOLOGICAL STUDY PERFORMED BY LAYNE CHRISTENSEN COMPANY WITH RESPECT TO THE FUTURE OF ANDERSON'S WATER PRODUCTION CAPABILITIES?

A The Layne Christensen Company hydrogeological study along with computer modeling of the well field provides the City of Anderson a higher degree of certainty that a water supply up to 12,000,000 gallons per day is available for the Lafayette Water Well Field and can be delivered to the Lafayette Water Treatment Plant. The hydrogeological study provides a high degree of technical assurance that it is reasonable to make improvements to Lafayette Water Treatment Plant.

19. Q PLEASE EXPLAIN CURRENT CAPABILITY OF THE LAFAYETTE WELL FIELD TO PRODUCE RAW WATER.

A The Lafayette Well Field contains two new water supply wells known as the Gahimer (2012) Well and the Hanna (2009) Well. Both of these wells are new and are capable of producing a combined total daily production of greater than 2,400,000 gallons per day.

At this time a new water supply well to replace the "Rock Well" is in the process of being constructed and initial test drilling suggests this well will be capable of approximately 1,500,000 gallons per day. This "Rock" Well should be fully operational by the summer of 2014. The three (3) newest water supply wells the Rock Well, Hanna Well and Gahimer Well and should produce 3,900,000 gallons per day.

Well Designation	Age	Condition
Hall Well	46 years+/-	Poor
Jarrett Well **(off line)**	46 years+/-	Poor
Srakengast Well	46 years+/-	Poor
Tuxford Well	46 years+/-	Poor
Tucker Well	46 years+/-	Poor
Wellborn Well	12 years+/-	Good

The other existing wells in the Lafayette Water Supply Well Field and there condition is as follows:

Five of the above existing wells have exceeded their 40-year useful life. Some of the above wells have experienced casing failure and have been lined with a smaller diameter casing with the annular space filled with grout to seal out contaminated water.

20. Q IN VIEW OF YOUR CONCERNS WITH RESPECT TO THE LAFAYETTE WELL FIELD WHAT ACTION DO YOU RECOMMEND BE TAKEN TO REMEDY THE DEFICIENCIES IN THAT WELL FIELD?

A I recommend that the Hall, Srakengast, Tuxford, and Tucker wells listed above be replaced with new gravel pack wells equipped with new pumping equipment, piping, valves, VFD motor controls, magmeter, SCADA controls, and a generator set to provide standby power.

These four (4) new water supply wells would be replacement wells for existing wells and be located in a close proximity to the existing wells and would utilize the existing raw water main.

21. Q AFTER CONSTRUCTION OF FOUR (4) NEW WATER SUPPLY WELLS WHAT WILL BE THE ESTIMATED RAW WATER PRODUCTION CAPABILITY OF THE LAFAYETTE WELL FIELD?

A summary of the estimated raw water production capability of the Lafayette Well Field is estimated to be as follows:

1. Existing Hanna & Gahimer Wells	2,400,000 gpd
2. Rock Replacement Well (in construction)	1,500,000 gpd
3. Four Recommended Replacement Wells	5,000,000 gpd
4. Wellborn Well	900,000 gpd
EST. RAW WATER SUPPLY AFTER IMPROVEMENTS	9,800,000 gpd

22. Q BASED ON THE ABOVE ESTIMATE OF RAW WATER PRODUCTION CAN WHAT WOULD BE THE IDEM SAFE RATED CAPACITY OF THE LAFAYETTE WELL FIELD?

A IDEM would rate the Lafayette Well Field based on the best production well being out of production. In this case it would be the Rock Well which would have a production of 1,500,000 gallons per day. Consequently the IDEM safe rating would be 8,300,000 gallons per day.

23. Q WHAT IS THE APPARENT DESIGN CAPACITY OF THE EXISTING LAFAYETTE WATER TREATMENT PLANT IN GALLONS OF FINISHED WATER TREATED PER DAY?

A The Lafayette Water Treatment Plant's water treatment capacity is defined by the capacity of the water filters. There are six (6) existing water filters and each water filter is rated at 1,666,000 gallons per day. However, for purposes of rating the water treatment plant one (1) filter must be taken off line and not included in the water plant rating. Therefore, the water treatment plant filters have a rated capacity as follows:

$$5 \text{ filters x} \frac{1{,}666{,}000 \text{ gallons per day}}{\text{Filters}} = 8{,}316{,}000 \text{ gallons per day}$$

24. Q WHEN THE IMPROVEMENTS TO THE LAFAYETTE WELL FIELD ARE COMPLETED, WILL THE LAFAYETTE WATER TREATMENT PLANT BE CAPABLE OF RELIABILITY PRODUCING ITS RATED CAPACITY OF 8,316,000 GALLONS PER DAY?

A No, the Lafayette Water Treatment Plant facilities cannot reliably produce 8,316,000 gallons of water per day for the near term or long term.

25. Q WHAT IS THE BASIS OF YOUR DETERMINATION THAT THE LAFAYETTE WATER TREATMENT PLANT ISN'T RELIABLY CAPABLE OF PRODUCING WATER AT ITS DESIGN CAPACITY?

A The six (6) existing water filters in the Lafayette Water Treatment plant are horizontal end piped pressure filters. They were installed in approximately 1968. The maximum daily pumpage that can be achieved through these filters is approximately 5,500,000 gallons per day. The water pressure going to the filters and out to the water distribution system increases for a variety of hydraulic conditions. Most importantly, water pressure increases to approximately 110 psi going into the pressure filters. This high pressure and the very deteriorated condition of the filters results in the development of major leaks when operating at 75% of the design capacity.

26. Q PLEASE DESCRIBE THE CONDITIONS EXPERIENCED AT THE LAFAYETTE WATER TREATMENT PLANT THAT CAUSE YOU TO BELIEVE THE PLANT IS NOT CAPABLE OF RELIABLY PRODUCING 5,500,000 GALLONS PER DAY OF TREATED WATER.

A There are several age related conditions that reveal the Lafayette Water Treatment Plant has exceeded its useful life of 30-years and is now exhibiting symptoms of failure. Some of the observable conditions and non-observable symptoms of partial failure are as follows:

<u>OBSERVABLE SYMPTOMS</u>
<u>OF</u>
<u>LAFAYETTE WATER TREATMENT PLANT DETERIORATION</u>

a. Filter face piping has leaks where pipes and fittings have ruptured
b. Horizontal water filters have patches welded on exterior where steel wall of water pressure filter split
c. Horizontal water filters have metal screws inserted into pin holes in filter wall
d. Filter head loss monitoring equipment is not adequate to measure pressure drop across the horizontal pressure filters
e. Motor controls and panels are obsolete
f. Telemetry panels are obsolete and not functional but partially active
g. Filter face piping valves are difficult to operate and difficult to seat gates
h. Aerators leak water onto top of detention tank
i. Concrete stairs and other surfaces are cracked, broken and eroded
j. Generator set and fuel tank located over clearwell
k. Epoxy floor coating is worn off or stained
l. Light fixtures are corroded by moisture in atmosphere

<u>NON - OBSERVABLE SYMPTOMS</u>
<u>OF</u>
<u>LAFAYETTE WATER TREATMENT PLANT DETERIORATION</u>

a. Pressure filter divider walls are pitted, welded and patch welded
b. Filter underdrain is pitted, welded and strainers partially plugged
c. Filter interior walls are pitted and patched in several locations

27. Q IN THE EVENT A PRESSURE FILTER OR FILTER FACE PIPING EXPERIENCES A MAJOR FAILURE, DO YOU CONSIDER THE CONDITION OF THE LAFAYETTE WATER TREATMENT PLANT TO POSE AN EMERGENCY SITUATION TO THE CITY OF ANDERSON?

A Yes.

28. Q DOES YOUR ENGINEERING REPORT RECOMMEND ANY ACTION TO BE TAKEN BY THE CITY OF ANDERSON TO ALLEVIATE THE POTENTIAL THREAT TO THE CITY OF ANDERSON'S PUBLIC WATER SUPPLY?

A Yes, we recommend the installation of a new water treatment plant to replace the Lafayette Water Treatment Plant.

29. Q WHERE IS IT PROPOSED TO CONSTRUCT THE NEW WATER TREATMENT PLANT TO REPLACE THE LAFAYETTE WATER TREATMENT PLANT?

A The land area surrounding the site where the existing Lafayette Water Treatment Plant is amply large, in terms of land area, to support the construction of a new water treatment plant to replace the Lafayette Water Treatment Plant. Utilization of the existing site would eliminate the cost of purchasing additional land and any associated land use issues. Further, much of the essential site improvements and existing utilities are already present at the existing Lafayette Water Treatment Plant site and would result in minimal cost to reuse these existing components.

30. Q COULD YOU IDENTIFY BY NAME SOME OF THE POTENTIAL COST SAVINGS THAT CAN BE REALIZED BY UTILIZING LAND OWNED BY THE CITY OF ANDERSON SURROUNDING THE EXISTING LAFAYETTE WATER TREATMENT PLANT, FOR PLACEMENT OF THE PROPOSED NEW WATER TREATMENT PLANT?

A The existing paved driveways, parking areas, site drainage, security fence, sanitary sewer, backwash water disposal, three phase electric service and ease of access to existing raw water main.

31. Q HAVE YOU CONSIDERED REPLACING THE EXISTING WATER FILTERS, FILTER FACE PIPING AND BRINGING THE EXISTING LAFAYETTE WATER TREATMENT PLANT UP TO THE SAME STANDARDS AS A NEW WATER TREATMENT PLANT?

A Yes, this possibility has been considered and investigated. However, it was dismissed because it would require extensive cost to install temporary piping to keep the existing water plant operational. Further, the existing water treatment plant would only be capable of operating at maximum of half of the existing water treatment plant while the other half is being replaced. The loss of 50% of water production from the Lafayette Water Treatment Plant would be an unacceptable condition in terms of meeting water demand by customers. The same is true of the electrical switch gear, motor controls and pump motors. The alternative of rehabilitating the existing Lafayette Water Treatment Plant isn't a desirable alternative due to demolition cost, temporary piping cost and is prohibitive in terms of threat to water supply for the distribution system.

32. Q DID YOU INCLUDE A PRELIMINARY ENGINEERING COST ESTIMATE IN YOUR PRELIMINARY ENGINEERING REPORT THAT WOULD INCLUDE THE COST OF ADDING REPLACEMENT WELLS IN THE LAFAYETTE WELL FIELD AND REPLACING THE LAFAYETTE WATER TREATMENT PLANT?

A Yes, a detailed preliminary cost estimate is included in the Preliminary Engineering Report.

33. Q DO YOU CONSIDER THE REPLACEMENT OF WELLS IN THE LAFAYETTE WELL FIELD AND REPLACEMENT OF THE LAFAYETTE WATER TREATMENT PLANT A LONG TERM SOLUTION TO THE POTABLE WATER NEEDS OF THE CITY OF ANDERSON?

A No, Anderson will gain a reliable 8,000,000 gallons per day of water supply and production capability that should function well for the next 25-years to 30-years. However, the Wheeler Avenue Water Treatment Plant should be considered short term asset in terms of its remaining useful life. Initial planning and development should be commended for the replacement of the Wheeler Avenue Water Treatment Plant in the next 5-years to 10-years. This planning should investigate the potential for a new well field to replace the Ranney Well Field at a completely different location. Investigation should consider location of a new water supply well field to be located on the northwest side of Anderson along White River.

34. Q CAN YOU DESCRIBE THE SCOPE OF PRELIMINARY PLANNING FOR A NEW WATER SUPPLY WELL FIELD?

A Yes, the City of Anderson has already utilized the services of a Professional Geologist with extensive experience in ground water location to make a preliminary recommendation for a future well field location. Based on initial assessments by the Professional Geologists an area has been designated where there is good potential for the presence of ground water in the quantities needed. The area for a potential well field has been delineated on paper. The next step would be to perform additional hydrogeological testing to actually better define the aquifer characteristics. Initially, resistivity testing would be performed and later test wells would be constructed along with production wells as necessary. Rights to occupy land and agreements with land owners are a fundamental component of verification of Anderson's next well field.

35. Q WHAT IS THE ESTIMATED TIME TO ACCOMPLISH THE PROCESS OF VERIFYING A NEW WELL FIELD?

A There are many variables involved in this process which will not be identified until the investigation begins. However, it would seem a minimum of 2-years would be necessary and possibly as much as 3-years to perform a detailed hydrogeological investigation for a new water supply well field.

36. Q GIVEN THE WATER QUALITY ISSUES WITH ASSOCIATED WITH THE RANNEY WELL FIELD AND THE ESTIMATED SHORT TERM LIFE EXPECTANCY OF THE WHEELER WATER PLANT, HOW SOON DO YOU BELIEVE THE DETAILED HYDROLOGIC INVESTIGATION SHOULD BE COMMENCED TO HAVE A VERIFIED WELL FIELD READY TO PROCEED TO FULL SCALE PRODUCTION?

A Immediately after this rate case is approved and funds are available to perform land negotiations, technical services, well drilling and computer modeling.

37. Q DOES YOUR ENGINEERING REPORT INCLUDE A PRELIMINARY COST ESTIMATE TO PERFORM THE HYDROGEOLOGICAL INVESTIGATION DESCRIBED ABOVE?

A Yes, it does.

38. Q DOES YOUR PRELIMINARY ENGINEERING REPORT ADDRESS LOST WATER AND IF SO WHAT IS THE CALCULATED PERCENTAGE OF LOST WATER?

A Yes table 2.4.1 of the Preliminary Engineering Report determines the lost water for the year 2012 and 2013 to be 23% and 22%.

39. Q DO YOU CONSIDER THIS RATE OF LOST WATER TO BE ACCEPTABLE IN TERMS OF THE FINANCIAL COST OF LOST WATER?

A No, this is not a satisfactory rate of lost water.

40. Q WHAT ACTIONS HAS THE CITY OF ANDERSON TAKEN IN RECENT YEARS TO ATTEMPT TO MINIMIZE LOST WATER AND WHY HAS LOST WATER REACHED THE PRESENT LEVEL?

A The City of Anderson has employed the services of a professional leak detection company that has in fact located many leaks that have been repaired. A major lost water reduction effort by the City of Anderson has been replacement of all of their customer's water meters.

The increasing lost water rate is believed to be occurring in existing "old" 2" through 4" Steel water mains and water lines. An extensive amount of these "old" steel water mains and lines were installed in the City of Anderson during the time period of time immediately after World War II and the mid 1950's. Galvanic corrosion of galvanized steel eats away at the interior and exterior of the wall of steel pipe resulting in leaks and ultimately pipe failure.

The City of Anderson has known the presence of this situation and has endeavored to repair leaks. However, the problem has worsened to the point where a greater portion of the steel mains and lines must be replaced. The ultimate answer is to replace all of the leaky steel water mains and water lines. The City of Anderson has in fact replaced all the water mains in certain sections of the city in years past.

41. Q ARE YOU AWARE OF ANY MAJOR AREAS IN THE CITY OF ANDERSON WHERE A COMPLETE WATER MAIN REPLACEMENT IS THE ONLY ALTERNATIVE TO THE LOST WATER ISSUE?

A Yes, there is a residential area known as the Homewood Development. This residential development has been a site of continuous water leaks in recent years and the only apparent answer is to replace the "old" steel water lines and mains.

42. Q WHAT ACTION HAS BEEN TAKEN BY THE CITY OF ANDERSON TO REMEDY THE LEAKS AND LOST WATER OCCURRING IN THE HOMEWOOD DEVELOPMENT?

A Approximately four years ago, the Waterworks believed they had funds to replace the water system in Homewood Development. The city authorized the preparation of engineering design consisting of preparation of plans and specifications to complete the water main replacement in this area. However, preliminary cost estimates and diminishing cash fund balances caused construction of the proposed project to be delays.

43. Q ARE THE PLANS AND SPECIFICATIONS COMPLETE AND COULD THEY BE UTILIZED TO COMPLETE CONSTRUCTION OF WATER DISTRIBUTION SYSTEM REPLACEMENT IN HOMEWOOD DEVELOPMENT?

A Yes, the plans and specifications are complete and with minor review and modification they could be utilized to complete this construction.

44. Q DOES THE PRELIMINARY ENGINEERING REPORT CONTAIN A CURRENT COST ESTIMATE FOR REPLACEMENT OF THE WATER DISTRIBUTION SYSTEM IN HOMEWOOD DEVELOPMENT?

A Yes, it does.

45. Q HOW QUICKLY COULD THE WATER DISTRIBUTION SYSTEM IN THE HOMEWOOD DEVELOPMENT BE REPLACED?

A Construction could be completed in approximately 6-months to 9-months after the funds become available to issue a construction contract.

46. Q WILL REPLACEMENT OF THE WATER DISTRIBUTION SYSTEM IN THE HOMEWOOD DEVELOPMENT BE THE END OF THE CITY OF ANDERSON'S PROBLEMS WITH "OLD" STEEL WATER MAINS AND WATER LINES?

A No, the City of Anderson will have an ongoing long term Issue with replacing water mains, locating leaks and repairing them. Also, they will need to establish priorities on those locations where major sections of water mains or water lines must be replaced

47. Q ARE YOU AWARE OF ANY OTHER WATERWORKS IMPROVMENTS AT THE WHEELER AVENUE WATER TREATMENT PLANT THAT IS CRITICAL TO THE RELIABILITY OF THE CITY OF ANDERSON WATEREP RODUCTION CAPABILITY

A Yes, there needs to be some piping modifications and demolition to the Wheeler Avenue Water Treatment Plant. There is a very old water treatment plant adjacent to the

Wheeler Avenue Water Treatment Plant that has been out of service for over 40 years. However, discharge piping that carries finished water from the Wheeler Avenue Water Treatment Plant to the existing clearwell passes through the old abandoned water treatment plant. This piping passes through the subbasement of the old water treatment plant and there are no valves to isolate this water main in the event of the need to shut down the water main. There is a maze of very old uninsulated piping in the basement of the old water treatment plant. The objective of this improvement is to reroute a new water main from the Wheeler Avenue Water Plant filters to the existing clearwell. The old abandoned water treatment plant is in poor structural condition, suffers from deterioration and serves no useful purpose. When the new water transmission main is installed the old abandoned water treatment plant should be demolished.

48. Q DOES THE PRELIMINARY ENGINEERING REPORT CONTAIN A COST ESTIMATE TO RELOCATE PIPING ESSENTIAL WATER PIPING AND DEMOLISH THE OLD ABANDONED WATER TREATMENT PLANT

A Yes, it does.

49. Q TO WHAT EXTENT WILL THE PROPOSED RECOMMENDATIONS DESCRIBED ABOVE IMPROVE THE CITY OF ANDERSON WATERWORKS?

A The recommendations for waterworks improvements proposed in this testimony and the Preliminary Engineering Report will serve as an important first step toward an overall waterworks upgrade. These recommendations provide in the first phase is a component of a phased approach that will minimize near term expenditures and enable the water utility to make better intermediate term decisions based actual residential, institutional, commercial and industrial growth.

Consequently, even after accomplishing the proposed improvements, there will be minimal excess water capacity to accommodate the water needs of any type of extraordinary water demand.

50. Q DOES YOUR PRELIMINARY ENGINEERING REPORT CONTAIN AN INDIVIDUAL PROJECT COST ESTIMATE FOR EACH PROJECT AND DOES IT CONTAIN A DETAILED PROJECT COST ESTIMATE THAT INCLUDES BOTH THE CONSTRUCTION COSTS AND NON-CONSTRUCTION COSTS?

A Yes, it does.

51. Q DO YOU UNDERSTAND THAT THE CITY OF ANDERSON IN ITS PETITION, FOR THIS RATE CASE, HAS REQUESTED A TWO PHASED WATER RATE INCREASE AND WHAT IS THE REQUESTED PERCENTAGE INCREASE WITH EACH PHASE?

A Yes I do. The requested rate relief consists of two rate increase phases each being a 21.18% rate increase. The first phase increase of 21.18% would be effective upon the Commission's Order in this Cause. The second phase, resulting in a 21.18% increase across the board, would be effective January 1, 2016. The compounded effect of the two (2) phases would result in an overall increase of 46.85%.

52. Q PLEASE DESCRIBE THE IMPLEMENTATION OF THE FIRST OF THE TWO PHASED RATE INCREASES AND HOW THE INCREASED REVENUE FROM THE FIRST PHASE FROM BE UTILIZED?

A After implementation of the first water rate phase the water sales revenue would begin to increase immediately upon adoption of the water rate tariff approved by the IURC. This requested water rate increase is for 21.18%. Revenue generated by the first phase of the requested water rate increase would be utilized to cover the costs of debt retirement costs, operations costs and maintenance costs.

53. Q WILL THE REVENUE GENERATED BY THE INCREASE IN REVENUE FROM THE PHASE ONE PORTION OF THE RATE INCREASE COVER ALL THE CURRENT OPERATIONS COSTS, MAINTENANCE COSTS AND DEBT RETIREMENT AND IF NOT HOW WILL THESE COSTS BE COVERED?

A No, the increased revenue generated from the phase one rate increase will not cover all of the current operations costs, maintenance costs and debt retirement. It will be necessary to defer some of the needed purchases until after the second phase of the water rate increase is implemented.

54. Q WHAT IS THE PERCENTAGE AMOUNT FOR THE PROPOSED SECOND PHASE OF THE WATER RATE INCREASE AND WHEN DOES THE PETITIONER PROPOSE TO IMPLEMENT THE SECOND PHASE RATE INCREASE?

A The percentage increase requested by the Petitioner for the second phase water rate increase is also 21.18%. The second phase of the water rate increase is proposed to commence implementation one (1) year after approval by the IURC for the two phase rate increase.

55. Q HOW WOULD THE REVENUE GENERATED BY THE SECOND PHASE OF THE PROPOSED WATER RATE INCREASE BE UTILIZED?

A The first portion of the revenue generated by the second phase of the proposed rate increase would be utilized fund the balance of operational costs, maintenance costs and debt retirement not funded by the first phase water rate increase. The balance of revenue generated by the second phase water rate increase would be dedicated to payment debt retirement of the proposed Waterworks Revenue Bonds that would fund the waterworks improvements previously described.

56. Q WILL THERE BE SUFFICIENT REVENUE GENERATED FROM THE PHASE TWO REVENUE TO SUPPORT THE DEBT RETIREMENT OF THE PROPOSED WATERWORKS IMPROVEMENTS?

A Based on current cost estimates and anticipated outcomes we believe our plan is reasonable. However, during the next several months there can be fluctuations in interest rates and inflation that could change the outcome of our plan. Implementation of each phase of the water rate increase and receipt of construction bids is critical in making the current estimates and assumptions correct.

57. Q CAN YOU MAKE A CONCEPTUAL ESTIMATE FOR WHEN IT WOULD BE POSSIBLE RECEIVE BIDS FOR THE PROPOSED WATERWORKS IMPROVEMENTS?

A Conceptually, a bond sale could move forward after implementation of the phase two water rate increase. With this rate increase there would be sufficient revenue to retire the bonds whose proceeds would be utilized to fund the proposed waterworks improvements. The initial activities can move forward for both a revenue bond sale and solicitation of bids construction bids for waterworks improvements immediately after approval of the phase two water revenue increase.

58. Q IN TERMS OF TIMING, WHEN WOULD BE THE IDEAL TIME TO COMMENCE CONSTRUCTION OF THE PROPOSED WATERWORKS IMPROVEMENTS?

A Commencing construction soon after May 1, 2015 would enable the City of Anderson to benefit from a full construction season and construction cost savings resulting from a full construction season.

59. Q IN VIEW OF THE CRITICAL CONDITION OF MANY OF THE CITY ANDERSON WATERWORKS FACILITIES, POINTED OUT IN THIS TESTIMONY, DO YOU THINK IT IS POSSIBLE TO HAVE ALL OF THE WATERWORKS IMPROVEMENTS COMPLETED AND OPERATIONAL BY THE END OF THE YEAR 2015?

A Yes, there is a possibility but this outcome is not an absolute certainty.

60. Q DOES THIS CONCLUDE YOUR TESTIMONY?

A Yes, it does.

CITY OF ANDERSON

MADISON COUNTY, INDIANA

2014 PRELIMINARY ENGINEERING REPORT

CURRY & ASSOCIATES, INC.

CONSULTING ENGINEERS & ARCHITECTS

Prepared By
Curry & Associates, Inc.
110 Commerce Drive
Danville, Indiana 46122

April 25, 2014

EXHIBIT REC-1

EXHIBIT REC-1

CITY OF ANDERSON

2014 PRELIMINARY ENGINEERING REPORT

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Board Of Public Works
Pete Heuer, Chairman
Roger Clark, Member
Charlie Jones, Member

Water Utility
Tom Brewer, Director

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EXHIBIT REC-1

City of Anderson
2014 Preliminary Engineering Report

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CHAPTER 1: PROJECT LOCATION

1.1 SERVICE AREA

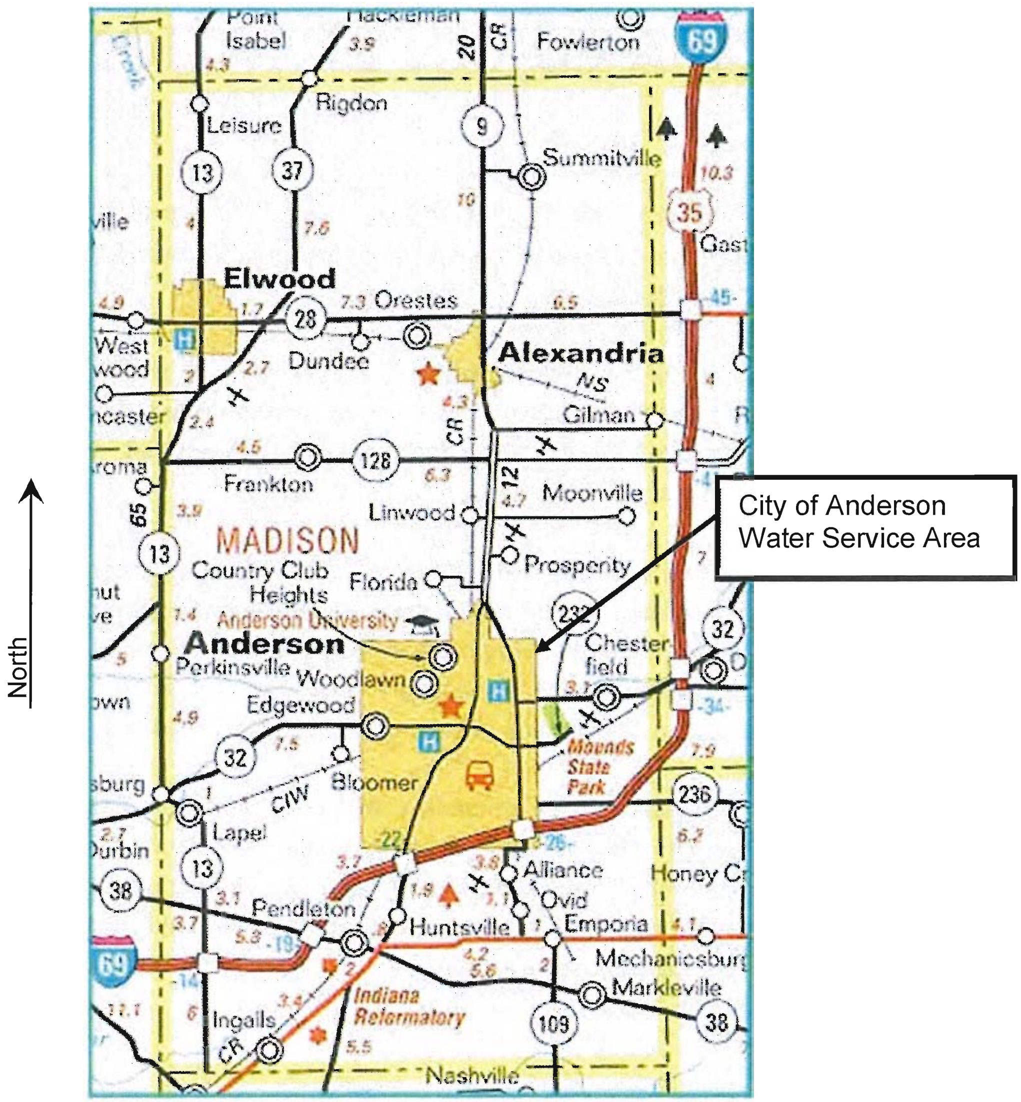
The City of Anderson is located in Madison County, Indiana. Figure 1.1.1 provides a location map for the City of Anderson. The Anderson Waterworks has been operational for over 110 years and currently serves approximately 21,500 customers.

The City of Anderson is located in the southern half of Madison County, immediately north of Interstate 69. There are three exits from I-69 to Anderson, providing excellent transportation access. State Road 9 is routed north to south through Anderson, while State Road 32 is routed east - west through the city. Anderson is located approximately 35 miles northeast of Indianapolis.

The White River flows from east to west through Anderson. The City of Anderson has historically been the home to many major manufacturing facilities, particularly related to the automotive industry. While the automotive industry has deteriorated, Anderson has been successful in bringing new industry to the City in recent years and is continuing to see substantial growth in commerce. Anderson is a major crossroads for railroads as well, with a number of access spurs to industrial plants.

The City of Anderson's water service area generally coincides with the city limits. The shaded area within the Anderson's City Limits in Figure 1.1.1 also defines their approximate current service area. The City of Anderson encompasses all of Anderson Township, and some bordering areas in Lafayette, Stony Creek, Fall Creek, Adams and Union Townships. For the purpose of this study the future service area is approximately the same as the current service area.

EXHIBIT REC-1



(No Scale Available)

Figure 1.1.1 Location Map for the City of Anderson, Madison County

Map Source: Madison County Map, INDOT

http://www.in.gov/indot/4286.htm

1.2 PROJECT STUDY AREA

The project study area for Anderson coincides with projected future service area as identified in Figure 1.1.2. The 20-year service area may grow slightly to extend around the edges of Anderson Township. The City of Anderson's water service area abuts the neighboring water utilities of Pendleton, South Madison, Edgewood, Alexandria and Chesterfield.

The proposed waterworks improvements will serve the current and projected service area. Projected new water customers for Anderson will include industrial, commercial and residential development. The City currently provides water service to residences, businesses and institutions within the City limits. Industrial development is planned in the southwest region of the service area at the Flagship Business and Industrial Park, and in other planned industrial parks.

1.3 PROJECT AREA

The proposed City of Anderson Waterworks Improvements include several project components. The project area for each project component is provided in this section, along with information regarding legal access and ownership of property.

1.3.1 Lafayette Well Field

The Lafayette Well Field consists of eight existing wells. The wells are located on individual parcels of property owned by the City of Anderson. The well field extends over approximately 20 square miles, from C.R. 300 North, north four (4) miles to C.R. 700 North, and from S.R. 9 west five (5) miles to C.R. 500 West. Four (4) of the existing wells shall be replaced by this project. The existing wells identified as "Hall", "Tuxford", "Srackengast" and "Tucker" shall be replaced. Each new well shall be constructed on the existing well property owned by the City of Anderson. The new well shall be connected to the existing raw water main, and all construction shall be upon the existing well property. No property acquisition shall be required for construction of new wells. Location maps for proposed well replacement are provided in Figures 1.3.1 – 1.3.4.

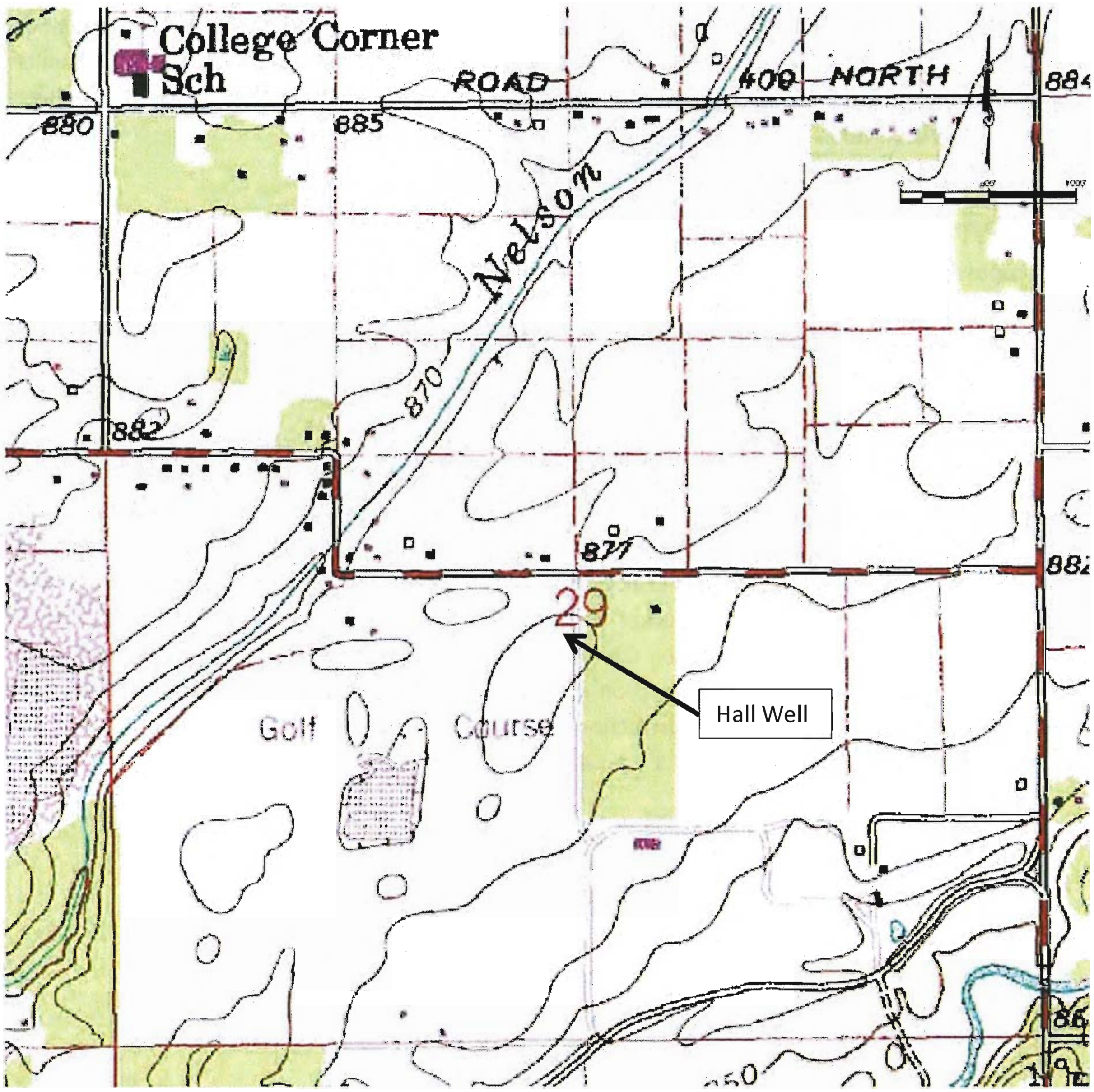


Figure 1.3.1 Hall Well Location Map

Township 20 North, Range 7 East, Section 29, Lafayette Township, Madison County (Anderson North USGS Quadrangle)

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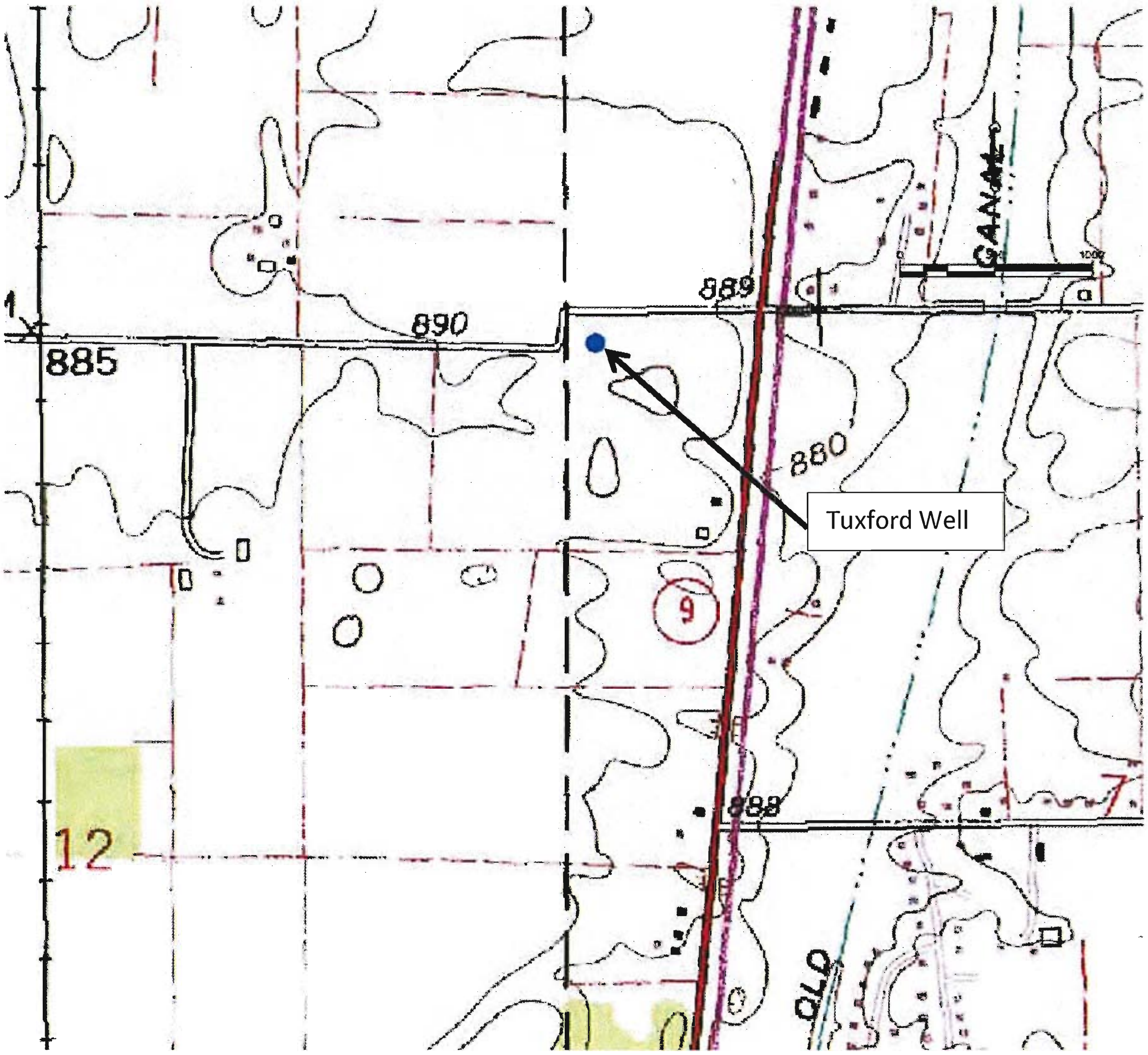

Figure 1.3.2 Tuxford Well Location Map
Township 20 North, Range 8 East, Section 7, Richland Township, Madison County
(Anderson North USGS Quadrangle)

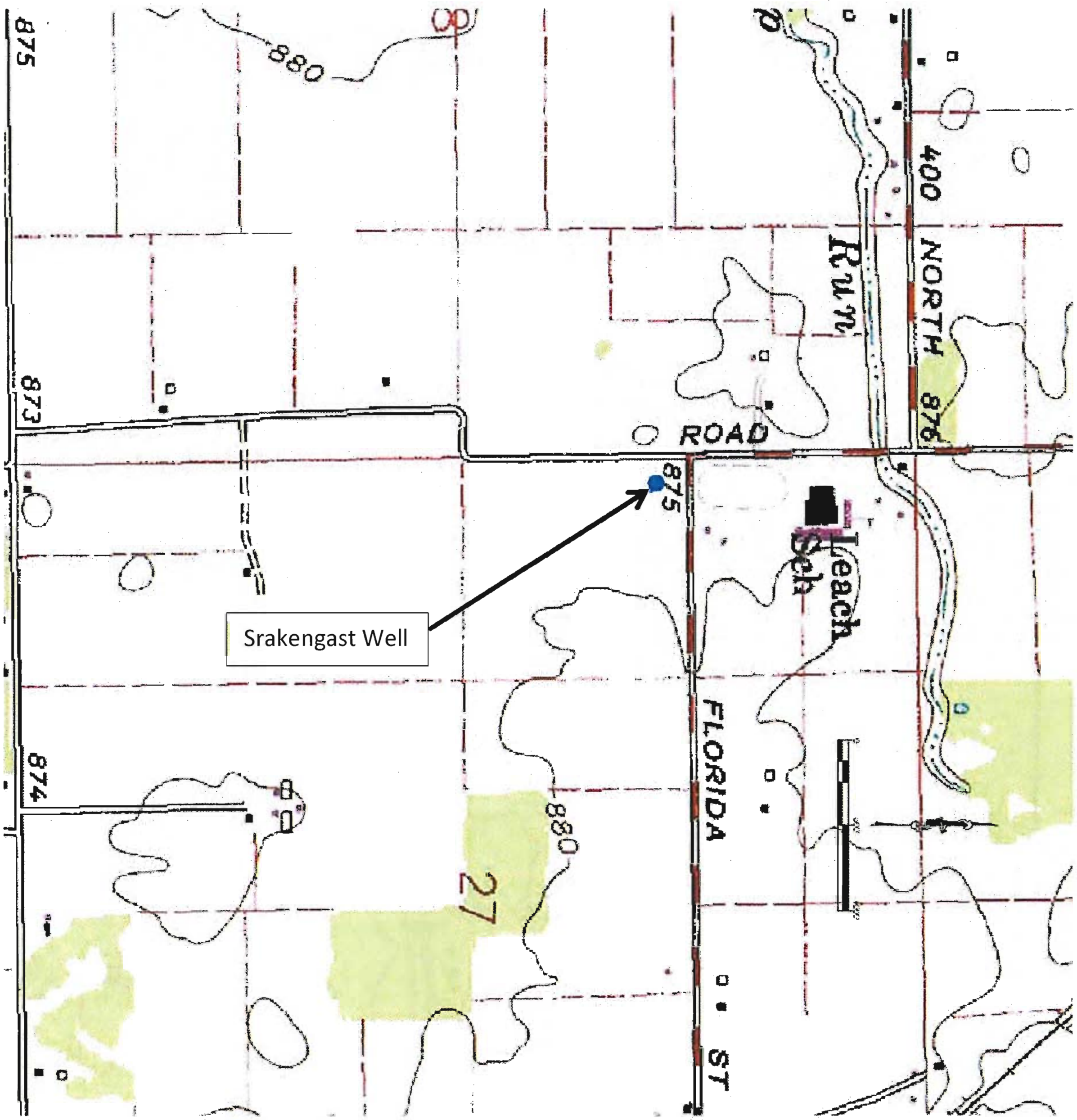

Figure 1.3.3 Srackengast Well Location Map
Township 20 North, Range 7 East, Section 27, Lafayette Township, Madison County
(Anderson North USGS Quadrangle)

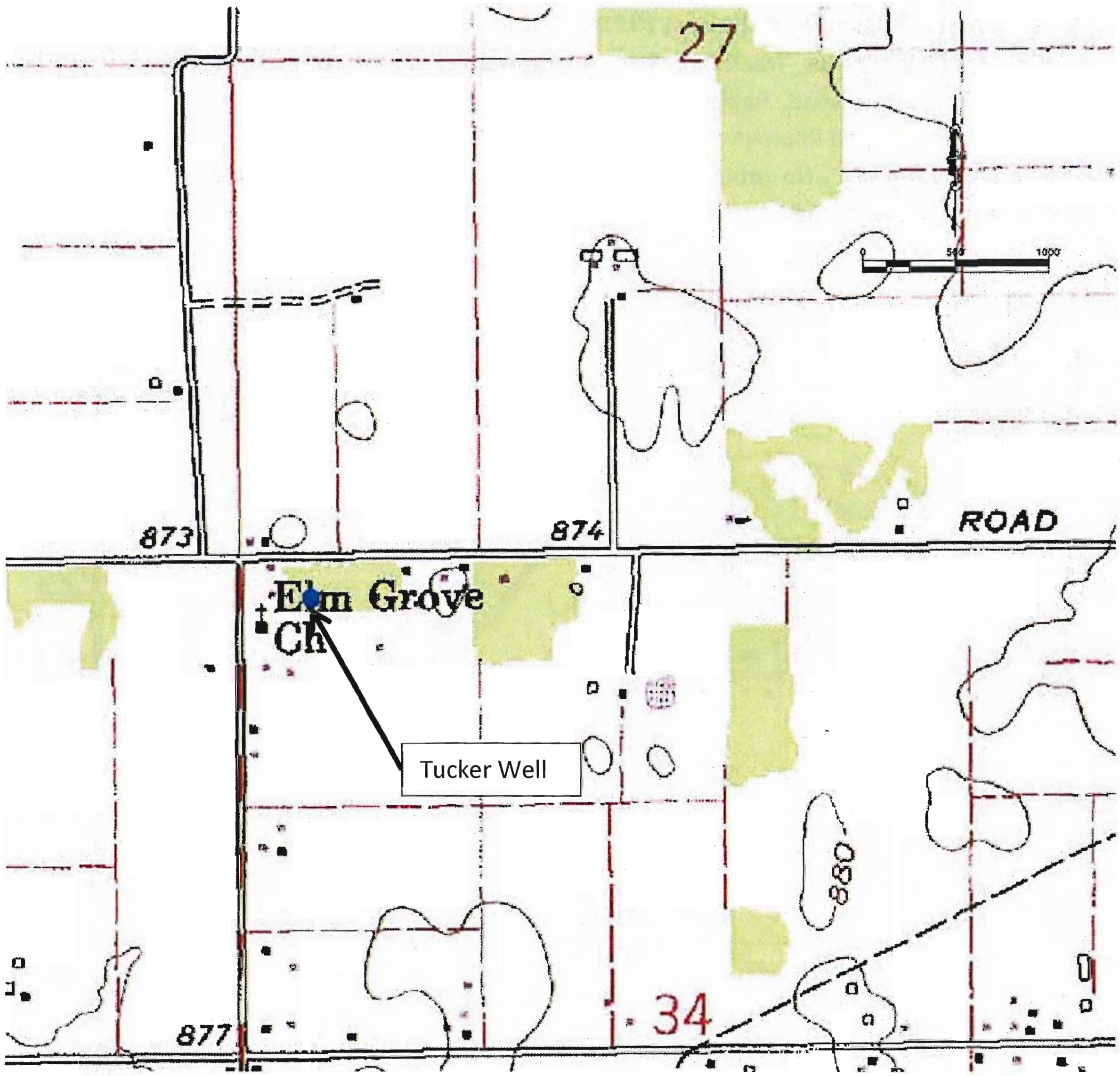

Figure 1.3.4 Tucker Well Location Map
Township 20 North, Range 7 East, Section 34, Lafayette Township, Madison County
(Anderson North USGS Quadrangle)

1.3.2 Lafayette Water Treatment Plant

The existing Lafayette Water Treatment Plant is located on the south side of C.R. 300 North, immediately west of the railroad. Replacement of the existing water treatment plant facility is proposed in this project. All proposed improvements shall be constructed within the limits of the existing City of Anderson owned property. No property acquisition shall be required for construction of the new Lafayette Water Treatment Plant.

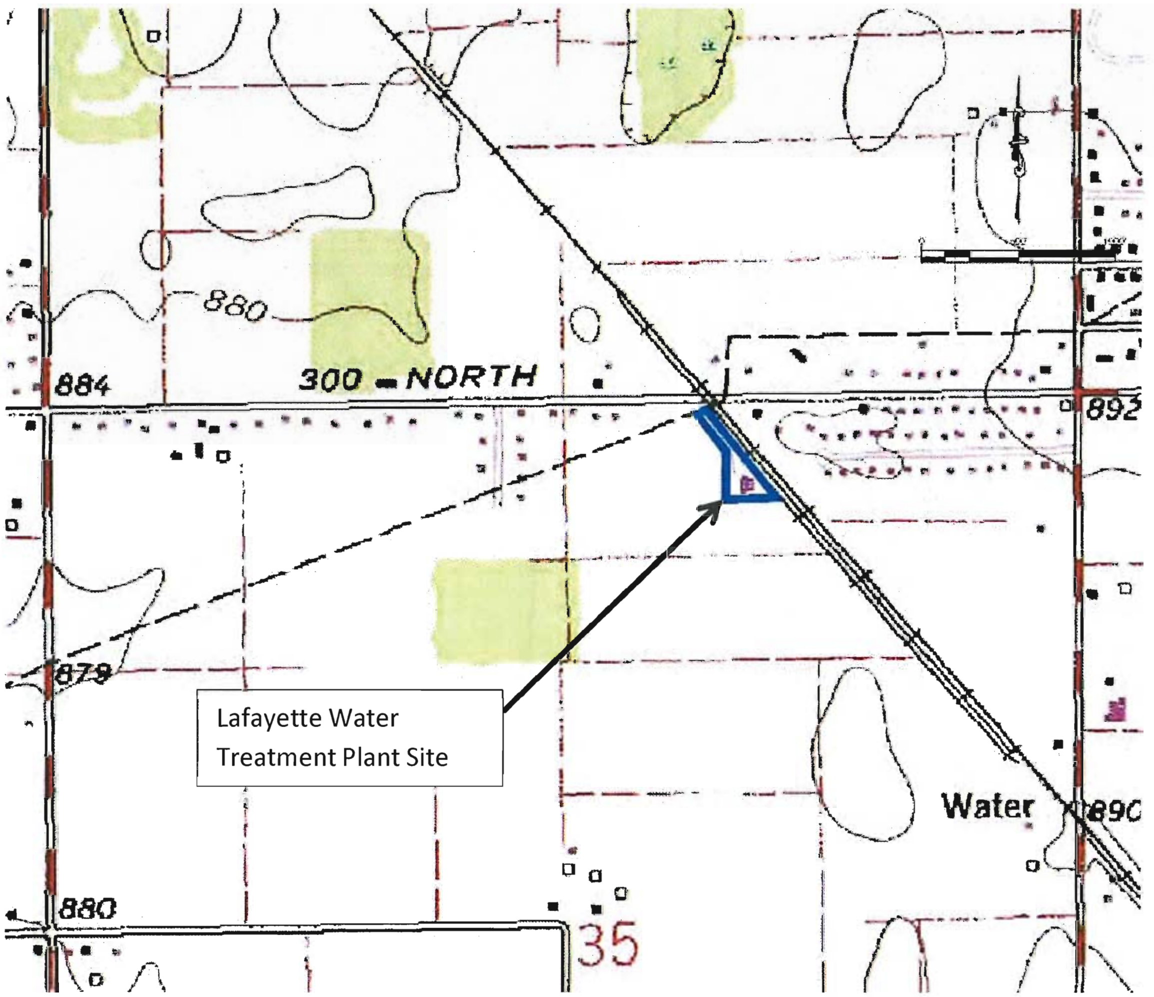

Figure 1.3.5 Lafayette Water Treatment Plant Location Map
Township 20 North, Range 7 East, Section 35, Lafayette Township, Madison County
(Anderson North USGS Quadrangle)

1.3.3 Water Main Replacement Project for Homewood Subdivision

The Homewood Water Main Replacement Project is located in an older residential area of Anderson. There are existing 2" and 3" steel and galvanized water mains serving this area. New 6" and 8" water mains are proposed to be constructed within the existing City road right-of-way. No easements or land acquisition are required for construction of the water main replacement project.

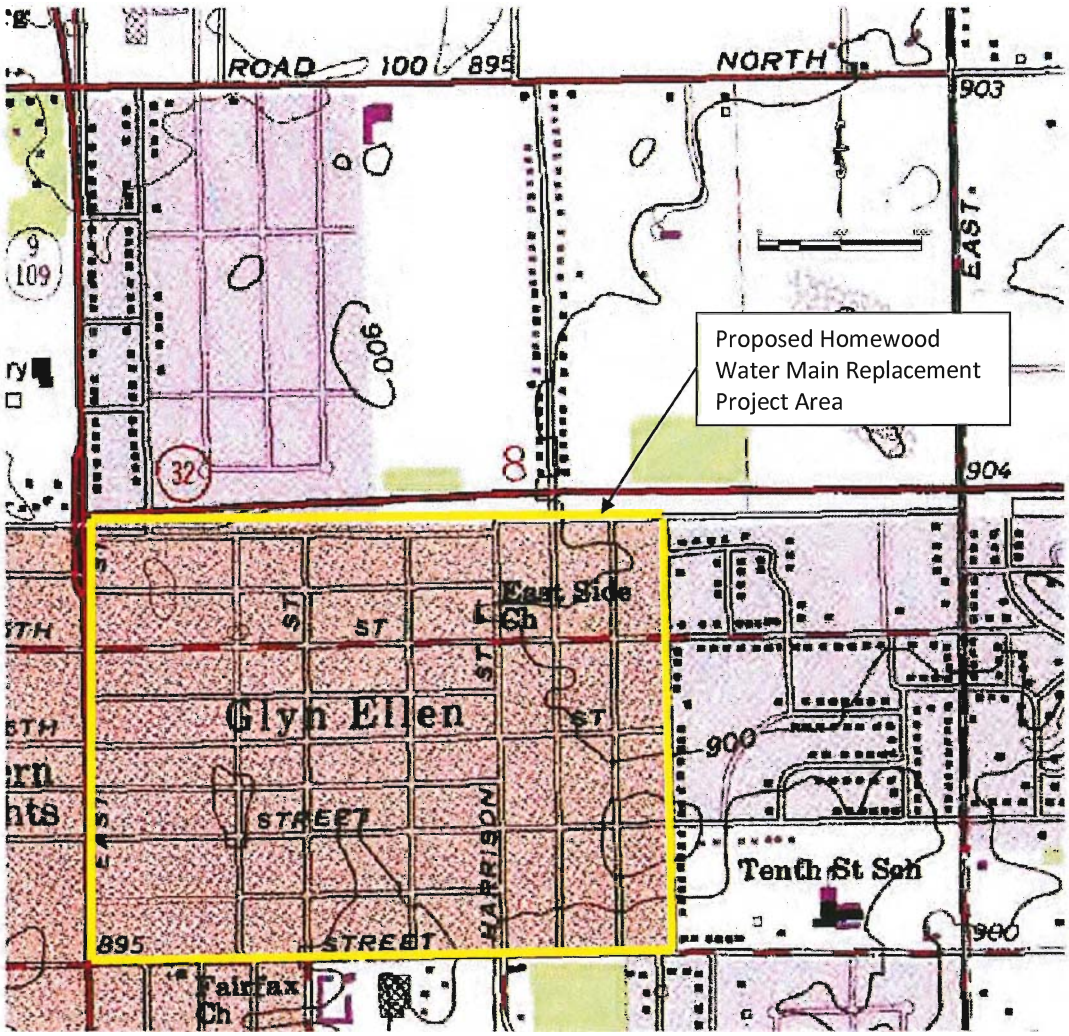

Figure 1.3.6 Homewood Water Main Replacement Location Map
Township 19 North, Range 8 East, Section 8, Anderson Township, Madison County
(Anderson South USGS Quadrangle)

1.3.4 Wheeler Water Treatment Plant Bypass Piping

The Wheeler Water Treatment Plant is located in downtown Anderson, adjacent to the White River. The original water treatment works building is in severely deteriorated condition. For health and safety purposes, this old building needs to be demolished. There is also critical finished water piping between the filters and clearwell that is routed through the basement of this old plant building. This piping needs to be re-routed outside of this building. This is a significant risk to the water utility, and the conditions of the building are not safe for personnel to access.

All work is proposed on the City of Anderson's water treatment facility property. No easements or land acquisition are required for construction of bypass piping and demolition of the old building.

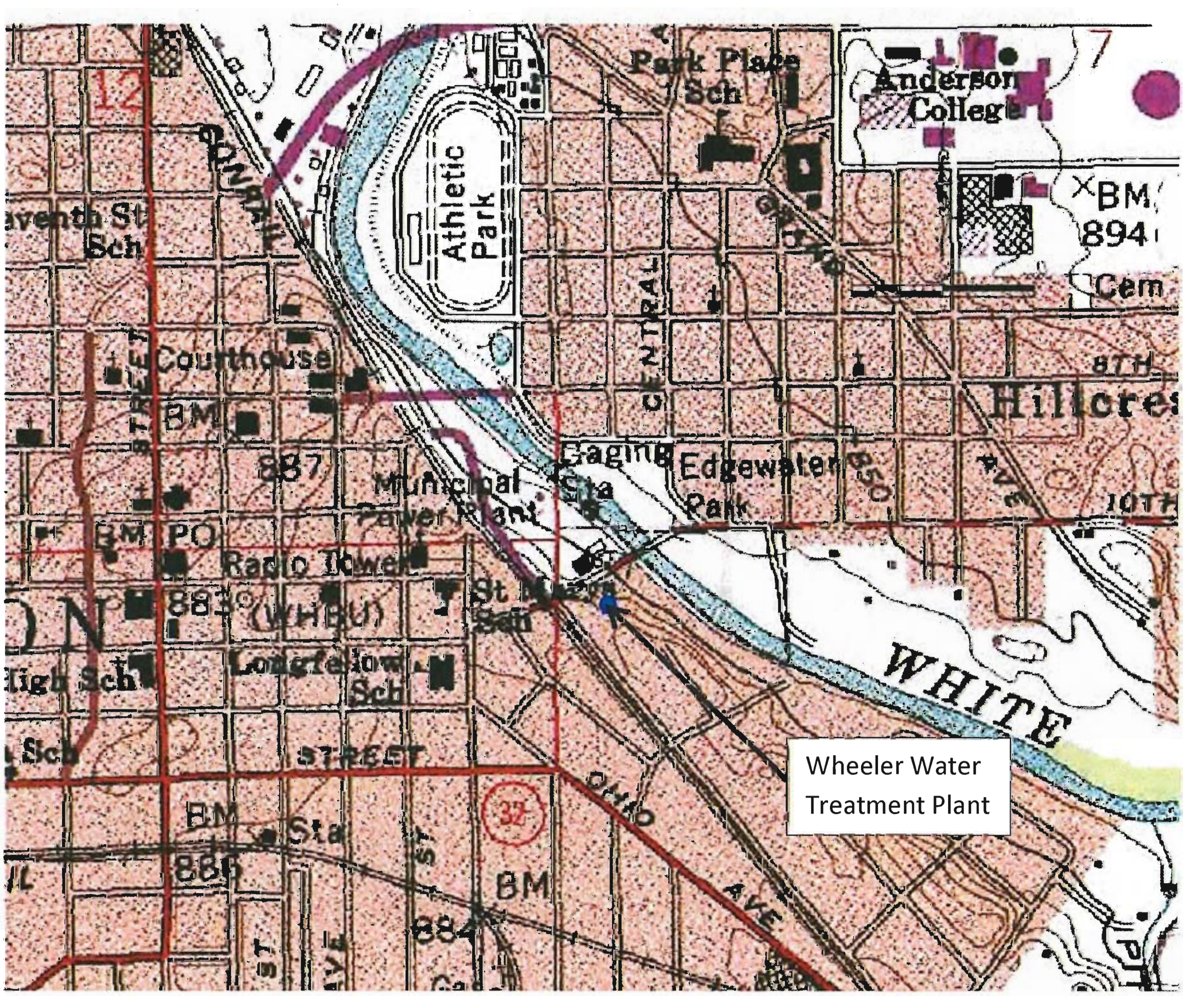

Figure 1.3.7 Wheeler Water Treatment Plant Location Map
Township 19 North, Range 8 East, Section 18, Anderson Township, Madison County
(Anderson South USGS Quadrangle)

CHAPTER 2: CURRENT NEEDS

2.1 EXISTING WATERWORKS

The existing City of Anderson waterworks consists of a mix of materials and components constructed over the past 100 years. The following sections provide information on the existing system components, age, condition, recent improvements, and water utility needs. The Anderson Waterworks includes three well fields, two water treatment plants and six elevated water storage tanks. Figure 2.1.1 provides a location map for the existing major components of the Anderson Waterworks.

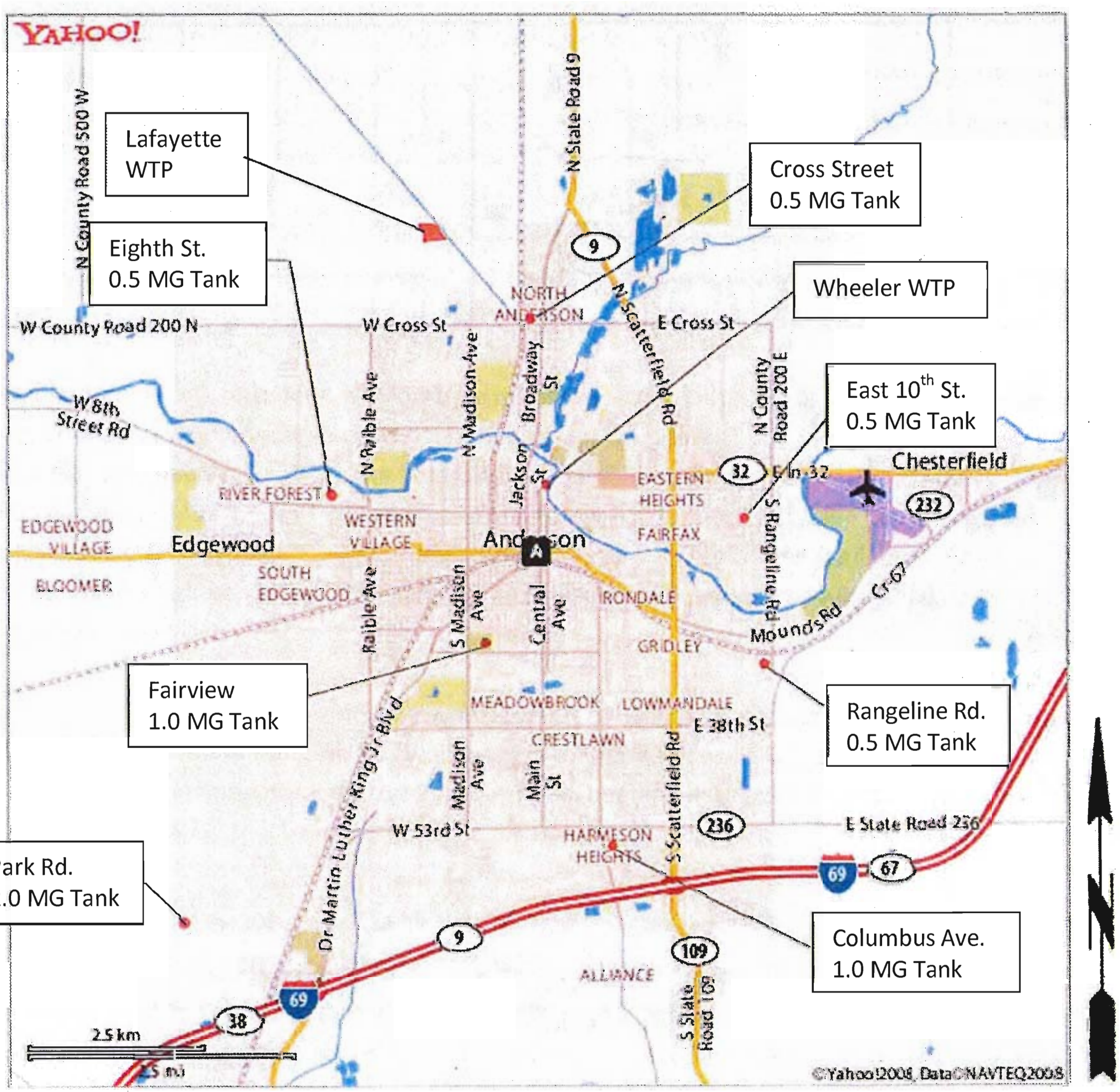

Figure 2.1.1 Location Map for City of Anderson Major Waterworks Components Map

Source: http://maps.yahoo.com

2.1.1 Distribution System

The City of Anderson has a large water distribution system containing water mains ranging in size from 2" to 30" and in materials from cast iron, steel, PVC, asbestos-cement, prestressed concrete to ductile iron. The ages of the various mains range from the time of origination of the water works up to current day installation. The City of Anderson currently installs ductile iron or PVC pipe as a standard. The distribution system has water loss issues and extensive effort has been made to reduce water loss. The lost water percent for 2012 was 23%.

The most problematic portion of the water distribution system that routinely impacts residential customers is the presence of 2" and larger diameter steel water lines. Many steel water mains were installed after World War II. The steel material corrodes over a period of time. Corrosion of the steel water mains is also impacted by the aggressiveness of soils. The City of Anderson does have aggressive soils in some areas. While this has affected the rate of corrosion over time, Anderson has reached the point where all of the steel water mains have severe corrosion and need to be systematically replaced. Approximately 5% - 10% of the overall water distribution system is composed of 2" diameter black steel or galvanized steel pipe. Approximately 50% of all 3/4" water service lines from the water main to meter are galvanized steel. The percentage of lost water is greatly affected by the pinhole leaks in these old 2" steel water lines and 3/4" water service lines. Sandy soils in some parts of Anderson cause these pinhole leaks to go undetected for long periods of time, resulting in substantial lost water.

The "Homewood" residential neighborhood has experienced problems related to the small diameter steel and galvanized water mains. The original water service to this neighborhood was constructed with primarily 2" and 3" steel water mains, which are deteriorated and do not have sufficient capacity to provide fire protection. Replacement of the water mains serving the Homewood Neighborhood is needed to protect human health, reduce lost water and provide fire flow capabilities. Replacement of the water mains would directly serve 422 residential homes, and would be beneficial to the surrounding areas.

Lastly, the utility desires to improve its ability to analyze flow and pressure data in the distribution system. A hydraulic model would allow the utility to analyze flow and pressure in the system to assess the impacts of new water users, increased demand, and proposed system improvements.

2.1.2 Water Supply

The City of Anderson has three distinct well fields. The three well fields produce the entire raw water supply to two potable water treatment plants. At one time Anderson utilized raw water from the White River, but that has been eliminated and all water now is produced from wells.

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The three well fields are identified as follows:

1. Ranney Well Field
2. Norton Well Field
3. Lafayette Well Field

The Ranney and Norton wells pump to the Wheeler Avenue Water Treatment Plant (WTP), and the Lafayette wells pump to the Lafayette Plant. See Appendix A, "Preliminary Source of Supply Investigation for Anderson, Indiana" and Appendix B "Evaluation of Groundwater Availability near Existing Well Fields" (both prepared by Layne) for additional information regarding Anderson's well fields.

Wheeler Treatment Plant Water Supply

Ranney Well Field

The Ranney Well Field is composed of four collector wells, plus two tubular gravel pack wells. All wells pump to the Wheeler Avenue Water Treatment Plant. The wells are located within the 100-year floodplain of the White River and Killbuck Creek. The location of the Ranney Well Field and Norton Well Field are identified in Figure 2.1.2.

The four Ranney collector wells were constructed in the 1940's and 1950's, and produce approximately 70% of the water treated at the Wheeler Plant. The Ranney wells are operational, but have declined in production capacity and efficiency over their many years of operation. The Ranney Wells have an expected useful life of 5-10 years, and would require major rehabilitation to extend their useful life beyond that time.

In 2010, Ranney Well #5 was identified as "Under the Direct Influence of Surface Water" by the Indiana Department of Environmental Management. In 2009, the Anderson Water Department made upgrades at the Wheeler Treatment Plant as required to meet regulatory treatment requirements for "Groundwater Under the Direct Influence of Surface Water". There is potential that other Ranney Wells could be classified as under the influence of surface water in the future.

Along with the four functioning collector wells, the Ranney Well Field includes two gravel pack tubular wells, designated as "Elder #1" and "Elder #2". These wells are approximately 5-7 years old and are in good condition.

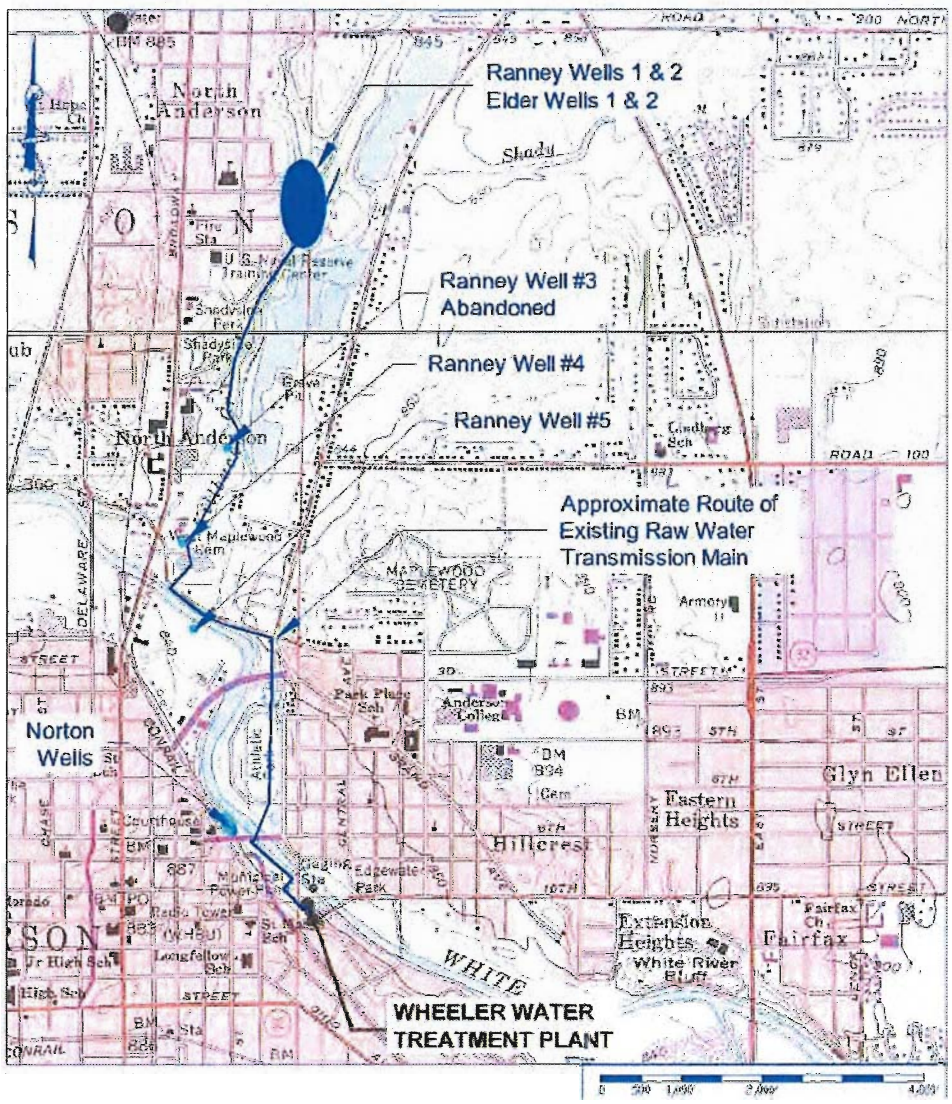


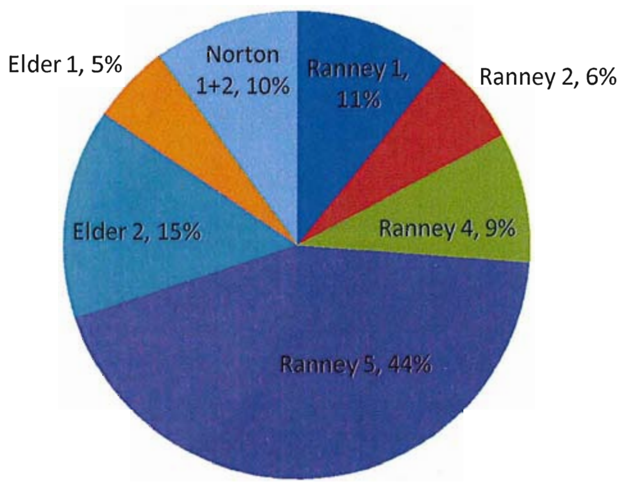
Figure 2.1.2 Ranney & Norton Well Field Location Map
(Source: Anderson South USGS Quadrangle, photorevised 1981)

Norton Well Field

The Norton Well Field is located near downtown Anderson, adjacent to the White River and the 8th Street Bridge. The well field contains two operating rock wells, each approximately 300 feet deep, referred to as "Norton #1" and "Norton #2". The Norton Wells were installed in 1910 and are therefore over 100 years old. Despite having exceeded their expected useful life, the Norton wells are operational. However, due to their age, the likelihood they will need to be replaced is high.

Figure 2.1.3 provides a graph of the percentage of well production to the Wheeler Plant from the water Ranney and Norton Well Fields in 2012. The Norton Well Field supplies approximately 10% of the water to Wheeler, while the Ranney Well Field supplies the remaining 90% of water.

Figure 2.1.3
2012 Wheeler Well Field
Average Day Water Production



Both the Ranney and Norton well fields are located in urban areas, which means the land is surrounded by a large number of old and/or unknown potential sources of contamination and not enough space to provide required setbacks. The possibility for well field expansion is severely restricted.

Lastly, the raw water main from the Ranney and Norton well fields is a 12,600 foot transmission main comprised of transite and cast iron pipe, which was installed over 60 years ago. The raw water main is located in the floodway of the White River and Killbuck Creek and is not accessible when the river is at flood stage. Transite and Cast Iron water main pipe tends to be very brittle and vulnerable to line breaks. A failure in this raw water main is a risk to the entire water production at the Wheeler Plant, as all water is pumped through this single line. If these well fields are continued in operation long term, a secondary raw water transmission main is needed to provide security in water production.

Lafayette Treatment Plant Water Supply

Lafayette Well Field

The Lafayette Well Field is located in Lafayette Township, northwest of the City of Anderson, as shown in Figure 2.1.4. The Lafayette Well Field contains eight tubular gravel pack wells. A ninth well ("Jarrett") is currently out of service and will be abandoned. These wells pump raw water to the Lafayette Water Treatment Plant.

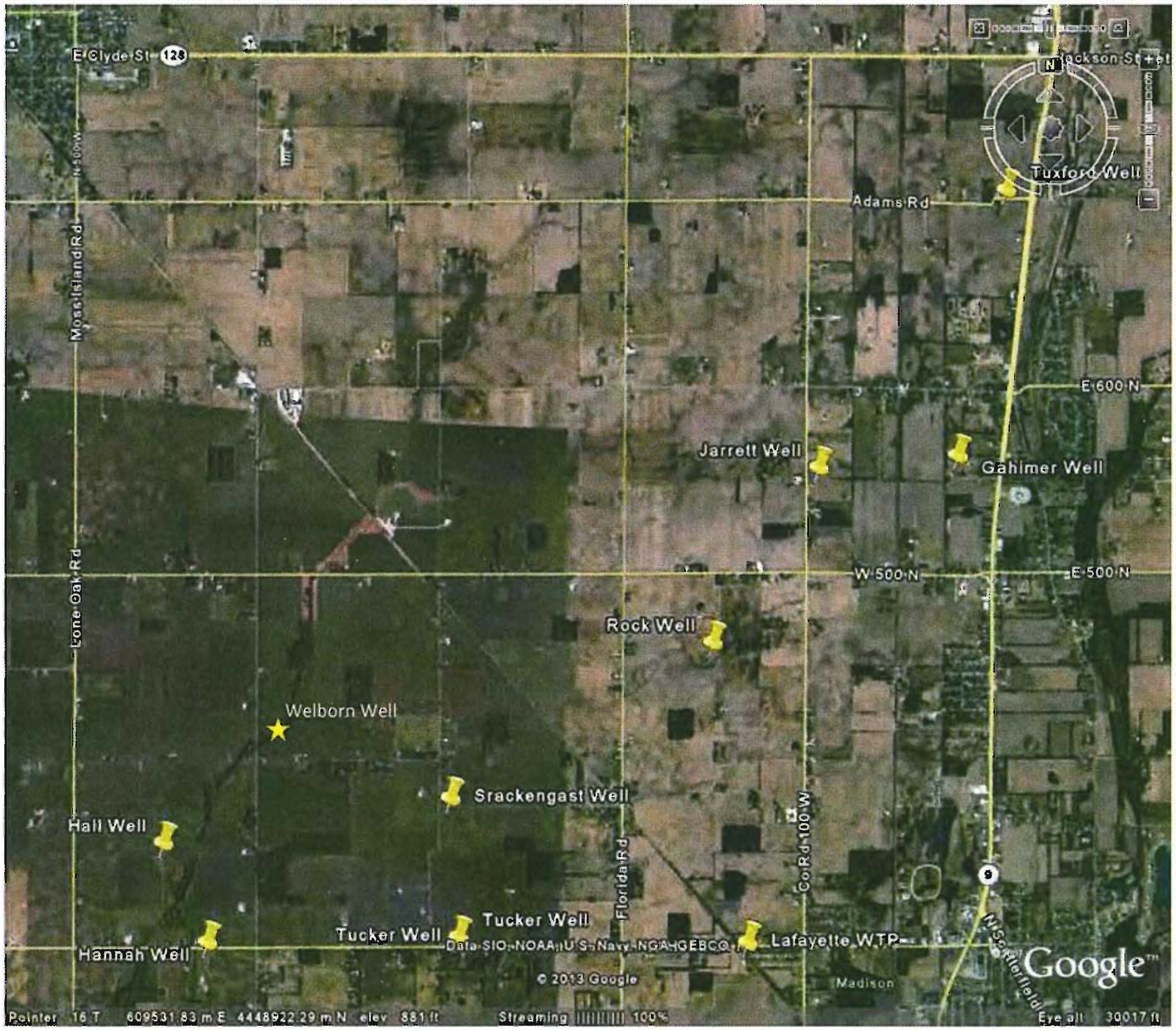
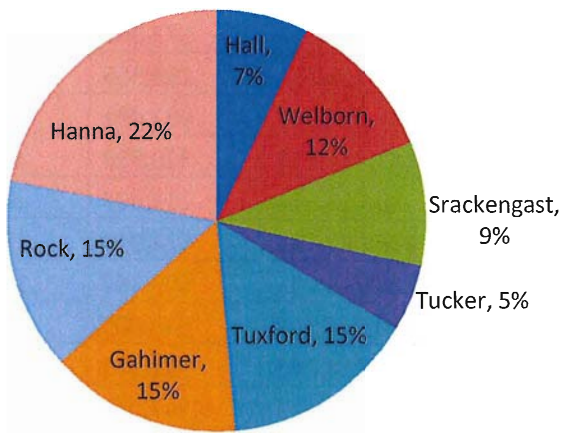


Figure 2.1.4: Location Map for Lafayette Wells
Anderson, Indiana

Figure 2.1.5 provides a graph of the percentage of water produced at the Lafayette Well Field in 2012. The Welborn, Hanna and Gahimer were constructed in 2002, 2009 and 2011, and produced 49% of the Lafayette Well Field production in 2012. The Hall, Srackengast, Tucker, Tuxford and Rock wells were constructed in 1967 - 1969. These old wells produced 51% of the Lafayette production in 2012, making them extremely critical to Anderson's overall water supply.

Figure 2.1.5 2012 Lafayette Well Field Water Production



The Rock, Hall, Srackengast, Tucker and Tuxford wells, while producing the majority of water from the Lafayette Well Field, are also the most in need of replacement. The pumping capacity and efficiency of these wells have degraded significantly over time despite regular maintenance. A normal interval for well cleaning is three years, but these wells require cleaning every year due to age and condition, the cost of which is $15,000.

In fact, the City is currently in the process of replacing the Rock well, which will be online by the summer of 2014. The original Rock well will be properly abandoned. The other two most recently-installed wells, "Gahimer" and "Hanna" are in good condition and are equipped with emergency generators. The other older wells do not have on-site back-up power. Provision of emergency power at the wells is critical to maintaining water production during power outages.

Table 2.1.2 provides the total and average daily water pumpage for each well in 2012. This table also compares the percent water contribution by each well to its respective treatment plant, and as a percentage of Anderson's total well production. The Lafayette Wells produced approximately 42% of Anderson's water supply in 2012, and the Ranney and Norton Well Fields contributed the remaining 58% of water production.

Table 2.1.2 2012 Individual Well Production Records

Well	2012 Total	2012 Average Day	% of Water Plant	% Total Production
Ranney 1	231,400,324	612,314	11%	6%
Ranney 2	138,801,732	368,415	6%	4%
Ranney 4	193,197,041	513,140	9%	5%
Ranney 5	941,511,222	2,499,206	44%	25%
Elder 2	312,321,599	828,934	15%	8%
Elder 1	117,250,535	311,161	5%	3%
Norton 1+2	217,569,917	577,387	10%	6%
Hall	110,709,333	293,355	7%	3%
Welborn	185,132,350	492,491	12%	5%
Srackengast	147,707,514	390,993	9%	4%
Tucker	80,453,514	213,803	5%	2%
Tuxford	236,082,183	624,819	15%	6%
Gahimer	229,714,921	609,388	15%	6%
Rock	230,054,347	610,905	15%	6%
Hanna	343,314,260	911,311	22%	9%
Total Lafayette	1,563,168,423	4,147,065	100%	42%
Total Wheeler	2,152,052,369	5,710,557	100%	58%
Total Water	**3,715,220,792**	**9,857,623**		

The Lafayette wells are located in a generally undeveloped, agricultural area with ample room for expansion.

2.1.3 Water Treatment

Wheeler Avenue Water Treatment Plant

The Wheeler Avenue Water Treatment Plant is located at the intersection of Wheeler Avenue and Cincinnati Avenue, adjacent to the White River. The Wheeler Plant was constructed in approximately 1947 to supplement a surface water treatment plant constructed in 1935. Surface water treatment was later abandoned and the Wheeler Avenue Treatment Plant became the primary treatment plant, treating only groundwater. The two plants are located adjacent to each other as shown in Figure 2.1.6.

Water is pumped from the Ranney Well Field and the Norton Well Field to the Wheeler Avenue Water Treatment Plant for processing. The Wheeler Avenue Water Treatment Plant consists of aeration, detention, and filtration. Water treatment at the Wheeler Plant is specifically for the purpose of iron removal.

The original design capacity of the Wheeler Plant is approximately 9.7 MGD with one filter out of service. Due to the limited production capacity of the well fields, the safe capacity of the Wheeler Plant is 5.5 MGD with Ranney #5 (highest production well) offline. The site is surrounded by urban areas and the White River, making any significant plant expansions or additions impossible.

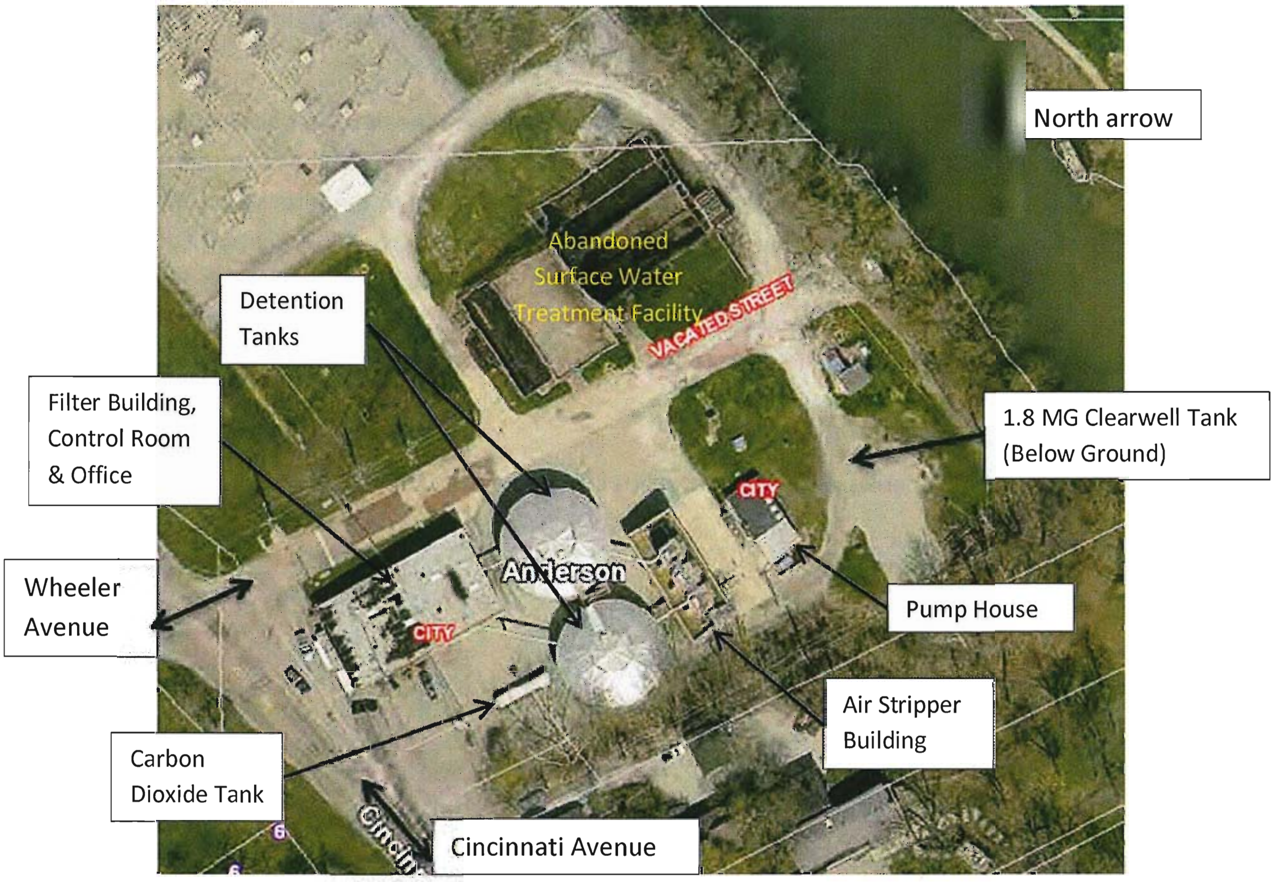


Figure 2.1.6 Wheeler Avenue Water Treatment Plant Site

Aeration

The air stripper process was added to the Wheeler Avenue Water Treatment Plant in 2000, when the Ranney Well Field developed ground water contamination due to petroleum based VOCs. Fluoride, chlorine, and coagulant are injected into the raw water ahead of the air stripper towers.

One byproduct of air stripping is removal of carbon dioxide which increases the raw water pH. With an increase in pH the hardness started to plate onto the filter gravel and filter media. A recarbonation system was added to the Wheeler Avenue Water Treatment Plant to lower the water pH at a point between the air strippers and the water plant filters.

Detention Tanks

Water flows from the air strippers to the detention tanks. The two detention tanks were originally constructed to serve as clarifiers for the surface water treatment facility. Each tank has a volume of 630,000 gallons. This provides a minimum of 3 hours of detention for oxidation of iron. Aluminum domes were installed to cover the tanks in 2000. The detention tanks are constructed of concrete and have a metal siding treatment on the outside. The tanks are in generally good condition.

Filtration

Water flows by gravity from the detention tanks into the filters. The Wheeler Plant has eight open top gravity filters. Due to the open top filters there is an elevated humidity level in the filter room. With the cold 55 degree well water there is a decreased ambient temperature in the filter room. These two characteristics combine to create extensive condensation in the filter rooms. A direct consequence of condensation of filter face piping and other steel components is corrosion. The Wheeler Plant filter room shows extensive corrosion due to condensation setting on pipes, valves, fittings and other steel components. The combination of age and corrosion has greatly diminished the structural integrity of most steel components in the filter room.

Figures 2.1.7 and 2.1.8 show corrosion in the flow splitter boxes and the filter wall.

Figure 2.1.7 Inside of Flow Splitter Box

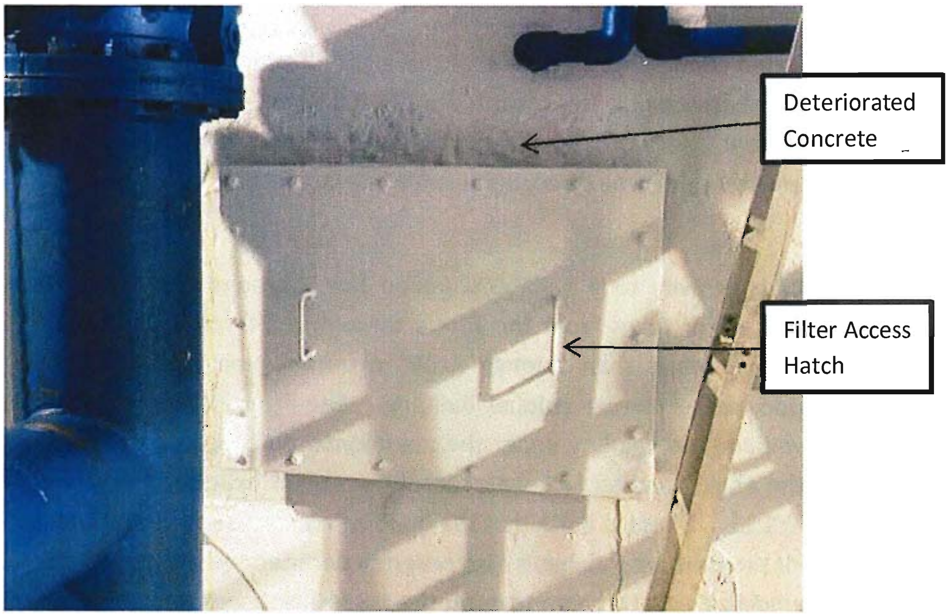


Figure 2.1.8 Filter Hatch in Concrete Filter Wall

Constructed in 1947 and 1967, the concrete filters are 50-70 years old. The cracks and leaks in the concrete filter walls are repaired annually with epoxy injection; see Figure 2.1.9. The concrete filter cells are reaching the end of their expected useful life. Repairs will continue to be necessary to maintain the operation of these tanks.

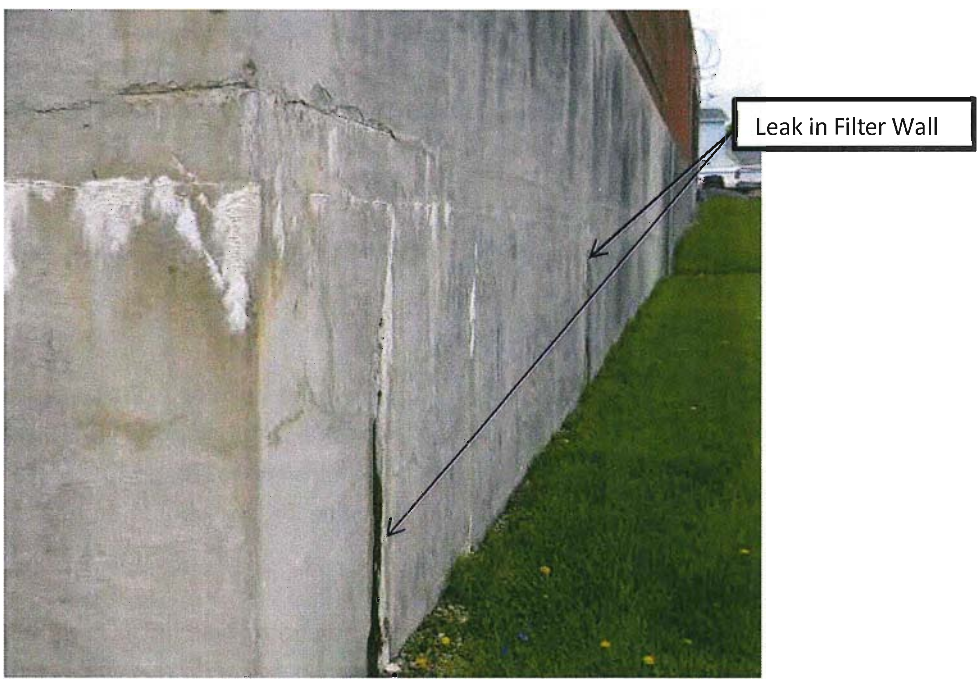


Figure 2.1.9 Exterior Wall of Filter on North Side of Filter Building

There are no automated controls for operation of the eight filters at the Wheeler Plant. All valves are manually operated for backwash. This plant is staffed full time with a Class V Certified Operator and support staff. A Class V Operator License became a requirement when the plant was converted for treatment of groundwater under the direct influence of surface water.

Clearwell

Filter effluent flows by gravity to a 1,800,000 gallon below-ground clearwell constructed in 1935. More specifically, the water flows from the filters through a 24" pipe under the 1933 abandoned surface water treatment plant, then through a 36" diameter pipe to the 1,800,000 gallon buried clearwell tank located east of the air stripper building. See Figure 2.1.6. The routing of the water through the clearwell and pipe gallery under the abandoned building is a two-fold risk to the City of Anderson. First, the abandoned surface water treatment plant building is severely deteriorated; see Figures 2.1.10 and 2.1.11. There is a risk that the building could collapse. Second, while the piping is not under significant pressure, the piping is also severely deteriorated and at risk for failure. A pipe failure under this building would threaten to drain the 1.8 MG clearwell and prevent delivery of finished water. The Wheeler Plant would have to be temporarily shut down for emergency repairs in such an event.

To bypass the abandoned surface water treatment building, new piping would have to be installed at a depth of approximately 20 feet and navigate a number of other water mains and existing utilities. The best time to construction such bypass piping would be when the Wheeler Plant is out of service and the clearwell tank is drained. Due to current water demand and limited treatment capacity at the Lafayette Plant, it is not possible to take the Wheeler Plant out of service for a few days.

Figures 2.1.10 and 2.1.11 provide a visual indication of the poor condition of the 1935 abandoned surface water treatment plant building.

Chemical Addition

The utility adds chlorine, fluoride, and phosphates via chemical feed equipment that is in good condition.

High Service Pumps

Four high service pumps are located inside the Pump House building. Three of the four pumps are original from 1965. One pump was replaced and a variable frequency drive (VFD) was installed on this pump motor in 2011. The VFD has been a significant improvement for pump control and safety. The three older pumps are near the end of their useful service life and should be replaced within the next five years.

Housed with the high service pumps, the emergency generator was installed with the plant in 1965. Although functional and exercised regularly, it is reaching the end of its reasonably expected useful life.

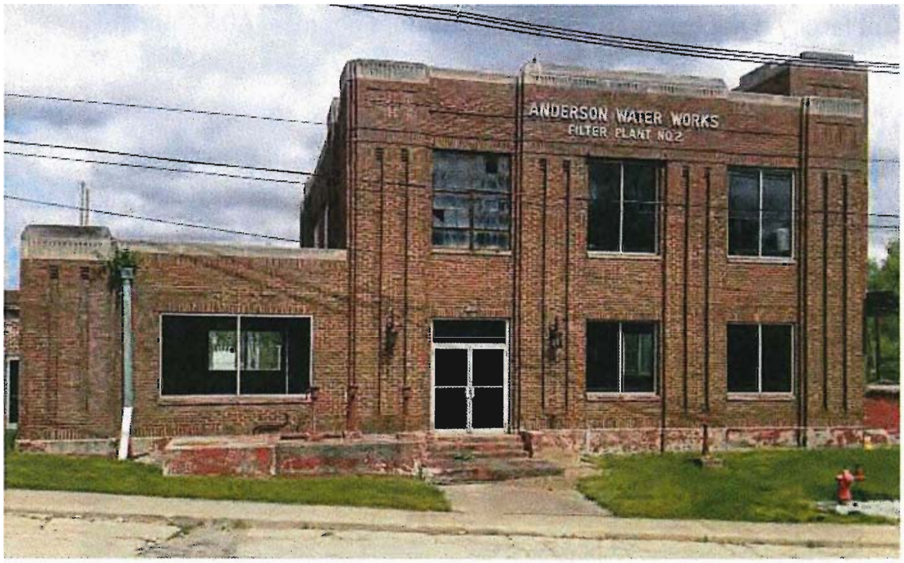


Figure 2.1.10 Abandoned Surface Water Treatment Plant Building


Figure 2.1.11 View Looking In Front Window on Left Side of Photo 2.1.10

Wheeler Plant Lab and Offices

The Wheeler Plant has very limited space for laboratory, offices, and storage. Figure 2.1.12 shows the entire lab space for the water treatment facility. The operators are challenged to perform necessary testing in this tiny lab space. This lab area is not acceptable for a water treatment facility of this magnitude.

The Wheeler Plant facility is not handicap accessible and does not meet ADA standards.

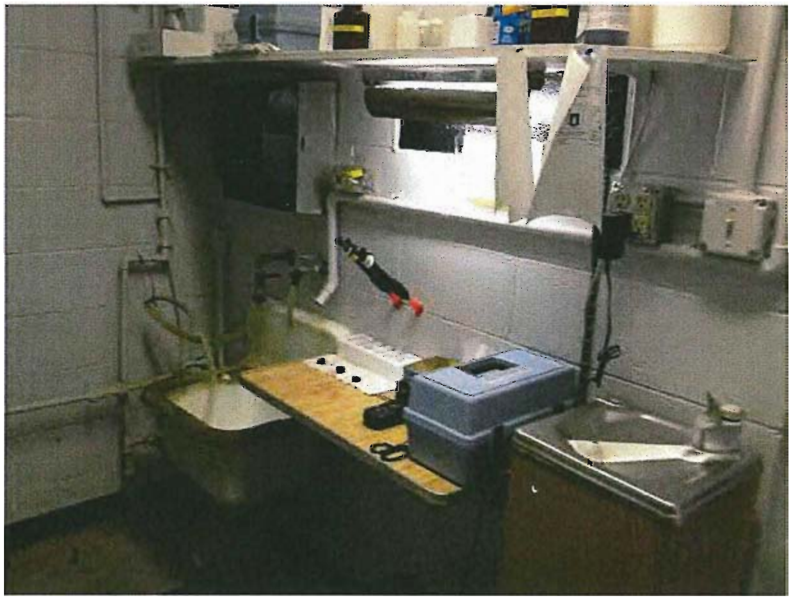


Figure 2.1.12 Laboratory at Wheeler Water Treatment Plant

Lafayette Water Treatment Plant

The Lafayette Water Treatment plant is located in the extreme north central portion of the City of Anderson on C.R. 300 North, approximately 2 miles west of Broadway Street. The water treatment plant was constructed in approximately 1969 and is supplied water from the Lafayette Well Field.

Water treatment at this water plant is for the purpose of iron removal. The water treatment process utilized is aeration, detention and filtration. The original design capacity of the Lafayette Plant is approximately 8.3 MGD with one filter out of service. Due to the limited production capacity of the plant, the safe capacity of the Lafayette Plant is 5 MGD with well "Hanna" (highest production well) offline.

The Lafayette Plant site is surrounded by generally undeveloped agricultural land that is owned by the city, making any needed new, expansion, or replacement work very convenient.

A photo of the Lafayette Plant is provided in Photograph 2.1.13. An aerial site plan is provided in Figure 2.1.14.

Figure 2.1.13 Lafayette Water Treatment Plant

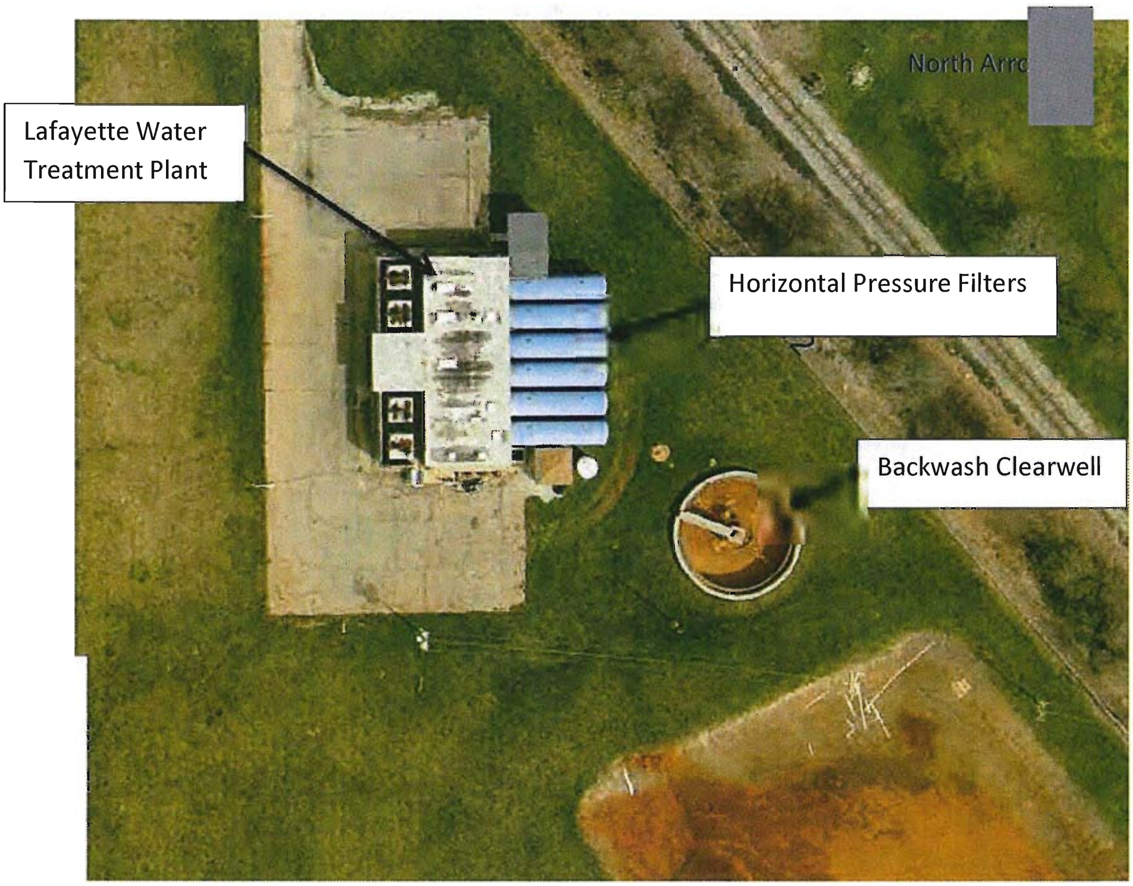


Figure 2.1.14 Lafayette Water Treatment Plant Site
(Source Madison County Council of Governments GIS http://arcgis01.madisoncty.com/gis/)

EXHIBIT REC-1

Aeration

The existing aerators are the original units installed in 1968. The units are 45 years old and are near the end of their useful life. Figure 2.1.15 shows one of the existing units. One of the units is bulging and needs to have some internal components re-built. Replacement of the four aerator units is recommended.

Figure 2.1.15 Aerator at the Lafayette Water Treatment Plant (1 of 4 Units)

Filters and Piping

The Lafayette Plant has six horizontal pressure filters. These filters have been operating at 60 – 100 psi for 45 years. While they have been maintained over the years, these filters are worn out and must be replaced. An inspection and repair in approximately 2008 concluded that these filters would not likely be maintainable for 5 more years. It is now past that 5 year window, and the filter's ongoing problems cause the plant to be operated at 75% capacity due to safety concerns. Leaks in the filters are dangerous, and a great risk to the utility. Several major leaks and failures in the steel filter bodies have occurred in the past few years.

The filter face piping is severely corroded, and there have been a number of repairs made to this piping. The fragile piping under high pressure is a safety hazard for staff, and poses a great risk to the water production. All of the high service pump and filter face piping must be replaced. Figure 2.1.16 provides a photo of the inside of a failed pipe section. This is consistent with all of the Lafayette Plant piping. Figure 2.1.17 provides a photo of the filter face piping.

Figure 2.1.16 Interior section of failed filter face piping at Lafayette Plant

Figure 2.1.17 Filter face piping at Lafayette Plant

EXHIBIT REC-1

It is not practical to replace the filter piping and filters, and maintain the treatment plant in production. Alternatives for accomplishing this have been discussed, but due to the very high risk of maintaining service, and the critical need to maintain production, rehabilitation of this plant is not recommended. Additionally, the electrical components of this plant are obsolete. New replacement components are not available for the Motor Control Center (MCC), and the operations staff have great challenges in finding replacement parts. A new water treatment plant needs to be constructed to replace the current Lafayette Plant. A new plant could be located on the current plant property.

The operational capacity of the Wheeler Avenue and the Lafayette Plants is limited by different factors, supply and plant issues, respectively. Table 2.1.3 outlines how existing capacity for both plants is determined.

Table 2.1.3 Capacity Summary for Anderson Treatment Plants

Capacity	Wheeler	Lafayette	Total
Plant Design (Wheeler on Groundwater)*	9,790,000	8,330,000	18,120,000
Plant Design (Wheeler on Groundwater Under the Direct Influence of Surface Water)**	6,480,000	8,330,000	14,810,000
Current "Safe" WTP Operating Capacity***	6,480,000	**5,000,000**	11,480,000
Existing Well Capacity****	**5,550,000**	6,422,400	11,922,400
Limiting Factor	*Supply*	*Plant*	*Total Safe*
Operational Capacity	**5,500,000**	**5,000,000**	**10,500,000**
* Wheeler Plant design rating of 9.79 MGD based on groundwater rate of 3 gpm/s.f.			
** Wheeler Plant design rating of 6.48 MGD based on surface water rate of 2 gpm/s.f.			
*** Current "Safe" Operating capacity is based on staff experience operating the plants.			
**** Existing Well Capacity means all wells operating with the largest producing well offline.			

EXHIBIT REC-1

2.1.4 Water Storage

The City of Anderson has seven water storage tanks and a total storage tank volume of 6,500,000 gallons. The names and capacities of the existing water storage tanks are provided in Table 2.1.4.

Table 2.1.4 Summary of City of Anderson Water Storage Tanks

Tank	Type	Capacity (gallons)	High Water Level Elev.	Head Ranqe
Cross Street	Elevated Leg Tank	500,000	1,006' msl	30'
Columbus Avenue	Sphere	1,000,000	1026' msl	30'
Fairview Park	Elevated Leg Tank	1,000,000	984' msl	30'
Range Line Road	Elevated Leg Tank	1,000,000	1,026' msl	30'
East 10th Street	Elevated Leg Tank	500,000	1009' msl	30'
Eighth Street	Elevated Leg Tank	500,000	1,015' msl	30'
Park Road	Elevated Composite	2,000,000	1,026' msl	42'
Total Water Tank Storage		**6,500,000**		

The ages of the elevated water storage tanks vary. The newest elevated water storage tank is the Park Road tank which was constructed in 2010. All of the elevated water storage tanks in the City of Anderson have been well maintained. Due to the quality of maintenance all of the elevated water storage tanks appear to be in sound structural condition. Each of the elevated tanks are inspected on a periodic basis and recoated to prevent deterioration due to corrosion.

2.2 PROJECT NEEDS

Evaluation of the Anderson Waterworks has identified a number of needs. The identified needs are summarized below.

2.2.1 Distribution System

The distribution system has a chronic problem of pipe corrosion in the small diameter steel mains and galvanized steel services. The City of Anderson is working to replace these failing pipes in order to improve service and reduce lost water. Water main replacement is recommended most urgently for the residential subdivision identified as "Homewood". This project will serve to replace undersized and leaking water mains with new larger water mains that will improve service, reliability and fire protection for the area.

The project also proposes a hydraulic model of the distribution system to improve its ability to analyze flow and pressure data in the system.

EXHIBIT REC-1

2.2.2 Water Supply

The Hall, Srackengast, Tucker and Tuxford wells are very old, and nearing the end of useful life. Anderson has worked hard to maintain these wells in order to keep them operational. The City of Anderson is at a critical point where new water supply wells must be developed to ensure the City's ability to continue to provide water to its existing customers and provide a long-term sustainable water supply. These aging wells must be replaced.

There are both land and water resources readily available for the addition of new wells in the proximity of the Lafayette well field. See Appendix B "Evaluation of Groundwater Availability near Existing Well Fields". This project proposes to add four new wells at the Lafayette well field to replace the Hall, Srackengast, Tucker and Tuxford wells.

Although the Ranney and Norton well fields contain wells that are also old and are reaching the end of useful life, the process for developing replacements for these wells is lengthier, as suitable land and water resources are not readily available. Due to limitations of location, space, and surrounding development, long-term replacement of the Wheeler Water Treatment Plant and water supply wells in their current location is not recommended. A new water supply is recommended to replace the Ranney and Norton wells. See Appendix A, "Preliminary Source of Supply Investigation for Anderson, Indiana". A hydrogeological study for development of a new well field is recommended as part of this project. The City of Anderson must accurately determine their water resource availability in order to make necessary long-term plans to meet the City's water needs.

The alternative to developing a new well field and treatment facility would be to purchase water from another entity. These two alternatives must be carefully evaluated as the City of Anderson plans for long term water needs. The construction of a new well field or connection to an alternate supply is recommended to be part of a later phase.

2.2.3 Water Treatment

The City of Anderson has maintained the Lafayette and Wheeler Water Treatment Plants to maximize the use of these facilities. However, the Lafayette Plant has several severely deteriorated major components and the entire facility needs to be replaced. The city owns sufficient property at the existing Lafayette Plant. This project proposes to construct a new plant to replace the existing one on the existing Lafayette WTP property.

The Wheeler Plant is also nearing the end of useful life. The treatment facilities have a projected remaining life of 5 – 10 years. There is no room for a new plant to be constructed at the Wheeler Plant site and, additionally, a new source of supply must be developed. The city will need to first develop a new source of supply and then plan for the construction of a new treatment plant. This process can be lengthy so it is recommended that the preliminary engineering begin as soon as possible.

Therefore, this project proposes an engineering study for alternatives to replace the existing Wheeler Plant and water supply wells. Alternatives include, but are not limited to, the development of a new source of supply and treatment plant or connection to another entity and converting to a purchased water system. The construction of the selected alternative is recommended to be part of a later phase.

Lastly, it is recommended that the city make the urgently needed safety improvements to relocate finished water piping underneath the Wheeler Avenue abandoned surface water treatment plant. The finished water piping between the filters and clearwell tank must be relocated to move the piping outside of the old building. The old surface water treatment plant building and adjacent tankage also need to be demolished for site safety purposes. This project proposes the installation of piping to by-pass the route which is currently located under the abandoned surface water treatment plant and demolition of the old building and adjacent tanks.

2.2.4 Water Storage

The City of Anderson completed construction of a new 2.0 MG elevated water storage tank in 2010. There are no urgent needs for additional water storage in the distribution system.

2.3 POPULATION

The City of Anderson's population was recorded as 59,734 for the 2000 Census. Anderson currently serves 21,500 customers.

EXHIBIT REC-1

2.4 CURRENT WATER CONSUMPTION

The City of Anderson produces all water at two treatment plants. Table 2.4.1 provides a summary of water production data for the years 2012 and 2013. The Peak: Average Day Water Pumpage ratio was 1.2 in 2012, and 1.3 in 2013.

Table 2.4.1 Summary of Anderson Waterworks Data for 2012 and 2013

Description	2012	2013
Average WTP Design Flow (gpd) *(Safe Capacity)* (Total of Two Separate WTP's)	10.5 MGD	
Peak Design Flow Peaking Factor =	11.5 MGD PF=1.1	
Average Daily Water Pumpage (gpd)	8,669,600	8,226,700
Peak Day Water Demand	10,665,500	10,658,600
Peak Hour Water Demand	7,000 gpm	7,000 gpm
Total Water Pumped (Gallons)	3,164,415,937	3,002,741,000
Average Daily Water Usage (Sold)	6.65 MGD	6.46 MGD
Total Water Sold (MG)	2,422,089,600	2,349,842,300
Estimated Public Water Use (flushing, fire protection, etc.)	<1%	<1%
Percent Water Lost - based on Yearly Total	23%	22%
Average Daily Backwash Water (gpd)	140,000	140,000

The water demand was higher in 2012 due to the drought conditions. Average daily water pumpage was approximately five percent lower in 2013 as compared to 2014.

2.5 CUSTOMERS

The City of Anderson serves a combination of residential, commercial, institutional and industrial customers. Table 2.5.1 provides a breakdown of the customer classifications and approximate average water use for 2012.

Table 2.5.1 Water Customer Distribution

Description	Percent of Total
Residential	60%
Commercial & Institutional	10%
Industrial	30%
Total	100%

Table 2.5.2 provides a listing of Anderson's 10 largest water use customers in 2012. It is noteworthy that the City of Anderson's 10 largest water users consumed approximately 1/3 of the total water sold in 2012. It is important to note that Nestle USA's water consumption increased by 71% over the past four years from 372,627,000 gallons in 2008, to 636,130,616 gallons in 2012.

EXHIBIT REC-1

Continued growth is projected for the Nestle USA facility in the future and reliable water supply is critical to their processes.

Table 2.5.2 Anderson's 10 Largest Water Users in 2012

Rank	Customer	2012 Water Use (gallons)	Percent of Total Water Sold
1	Nestle USA	636,130,616	26.3%
2	St. Vincent Health	34,130,492	1.4%
3	East Side Dairy Prop	31,698,744	1.3%
4	Hoosier Park LLC	23,600,148	1.0%
5	Community Hospital	18,681,300	0.8%
6	Resin Partners, Inc.	12,742,928	0.5%
7	WPC/ACCT Dept	11,000,836	0.5%
8	Redbud Estates	10,157,092	0.4%
9	Hoosier Woods	8,390,316	0.3%
10	Cross Lakes Apartments	8,302,800	0.3%
		794,835,272	32.8%

CHAPTER 3: FUTURE NEEDS

3.1 POPULATION: CURRENT AND FUTURE

The City of Anderson's current service area is generally extends to the city limits. The population data for the City of Anderson is considered for this study to be representative of the service area. Table 3.1.1 provides a summary of population census data and growth per decade for the City of Anderson. Census data demonstrates an average growth of 21% per decade from 1900 - 1970. Anderson has been a major industrial hub for Indiana since the beginning of the Industrial Revolution. The City has suffered severely from the closures of manufacturing facilities since the 1970's, especially in the automotive industry. From 1970 to 2000 the population of Anderson decreased by 11,000, representing a nearly 16% decline.

Population growth declined from 1970 to 1990, and saw relatively negligible change from 1990 to 2000. Based on the lack of population growth in Anderson over the past 30 years, there is not expected to be significant growth over the next 20 years. Future increase in water demand is anticipated to come primarily from industrial and commercial customers. A minimal growth rate of 0.2% per year is recommended for planning purposes to allow for some modest residential customer growth.

Table 3.1.1 Population Data

City of Anderson		
Year	**Population**	**% growth**
1900	**20,178**	
1910	**22,476**	**11%**
1920	**29,767**	**32%**
1930	**39,804**	**34%**
1940	**41,572**	**4%**
1950	**46,820**	**13%**
1960	**49,061**	**5%**
1970	**70,787**	**44%**
1980	**64,695**	**-9%**
1990	**59,459**	**-8%**
2000	**59,734**	**0%**
1900-2000 Average		**13%**
1970 - 2000 Average		**-6%**

The source of data is www.stats.indiana.edu

The City of Anderson had approximately 21,500 customers at the end of 2013. The ongoing future growth rate of 0.2% per annually would result in customer growth to approximately 22,420 in the year 2033. This is an increase of 920 customers over the 20 year planning horizon.

The City of Anderson anticipates future water demand may increase more significantly from industrial development. The Nestle manufacturing facility is a relatively new industrial customer, and has become Anderson's largest single customer. In 2012 Nestle USA purchased 26% of all water sold. Nestle has nearly doubled their water consumption in the past four years. Nestle is located in the Flagship Industrial and Business Park, which has been developed to attract more advanced manufacturing and industrial facilities to Anderson.

3.2 20-YEAR DESIGN FLOW PROJECTIONS

The recommended 20-Year design flows are based on population growth projections, business growth projections, historical water usage, and customer information. The annual customer growth is estimated to be approximately 0.2% over the next 20 years. For planning purposes, it is estimated that Anderson's water demand will increase 40% over the 20-year planning period. The projected daily pumpage for 2033 is 12.8 MGD, with estimated sales of 9.9 MGD. This maintains the same lost water rate of 23% as recorded in 2012. If lost water is reduced in the future the projected water requirements may be adjusted down accordingly.

Table 3.2.1 provides the Design Treatment Plant Flow data. The projected 20-Year projected daily design flow requirement is 12.8 MGD. The existing water treatment facilities have a combined daily design (safe capacity) rating of 10.5 MGD. The existing treatment capacity is not sufficient to meet the projected 20 year water needs.

The projected distribution of customer types is not expected to change from the current situation. The use by different customer classifications may shift, as industrial growth continues. It is possible that changes will occur in this distribution within the 20-year planning period.

Table 3.2.1 Proposed Design Flow Data

Customer Type	Flow
Domestic (D) 60%	7,680,000 gpd
Commercial & Institutional (C) 10%	1,280,000 gpd
Industrial (I) 30%	3,840,000 gpd
Total DCI	12,800,000 gpd
Average Design Flow	12.8 MGD
Peak DCI	16 MGD
Peaking Factor	1.25
Peak Design Flow	16 MGD

Anderson does not have sufficient current water production capacity to meet existing water use requirements. Production capacity is declining as the treatment plants and wells near the end of useful life. Construction of new water supply wells and treatment facilities or connection to another entity is required to provide for the current and future water supply needs of the city.

3.3 20-YEAR WATER SYSTEM NEEDS

The City of Anderson's current water system needs are described in Chapter 2; future needs are described below.

3.3.1 Distribution System

The water demand on the southwest side of the Anderson distribution system has experienced steady growth in recent years. Anderson's original infrastructure was designed to serve significant industrial and commercial water users in the east-central region of the city. The majority of those earlier large industrial water customers have closed their operations in Anderson. New industrial development is currently located on the southwest side of Anderson, and the growth in this area has been significant. The Nestle facility is largest industry to locate in this area to date, but there have been a number of other new industrial corporations moving to Anderson in recent years.

New development on the southwest side of Anderson and loss of industry in the east-central portion of the city has shifted the water demand location. The 24" and 30" diameter transmission mains constructed to serve the east-central facilities are not able to serve the current southwest industrial development. Water transmission main improvements are needed to convey water to the southwest side of Anderson in order to meet water consumption requirements and fire protection needs.

Due to existing customers and future growth, water transmission mains are needed to increase capacity and reliability of service to the southwest region of Anderson. The projected growth in development and water demand is focused on the southwest segment of the distribution system. The Flagship Industrial Park area is served through a combination of 20" and 16" diameter water transmission mains from the downtown transmission loop. A second water transmission main to this area would provide increased capacity, service redundancy and looped service. In the next 20 years, a new water transmission main will be needed to serve the current and projected future needs in these areas.

3.3.2 Water Supply

As described in Chapter 2, the Ranney and Norton well fields contain very old wells that will reach the end of their useful life in the next 5-10 years. The current project proposes a study to investigate a new supply to replace these old wells and in the next 20 years, construction of the new source of supply should be initiated. Alternately the city should investigate opportunities to purchase water from another entity.

3.3.3 Water Treatment

As described in Chapter 2, the Wheeler Avenue Water Treatment Plant will reach end of useful life in the next 5-10 years. The current project proposes a study to investigate development of a new supply and purchase of water from another entity. Once the best long-term solution for Anderson is determined, construction of the necessary facilities should be initiated.

3.3.4 Water Storage

Under the forecasted growth rate for the next 20 years, the utility should plan to add additional storage capacity and rehabilitate and/or replacement water storage tanks as needed due to age.

EXHIBIT REC-1

Chapter 4: Selected Plan

4.1 GENERAL

This report examines the various components of the City of Anderson's waterworks. The primary needs for the City of Anderson are raw water supply, water treatment and water main replacement. These components are critical to the current and long-term operations of the Anderson Water Utility. This chapter provides details of the recommended plans, including an estimate of probable costs.

4.2 WATER DISTRIBUTION SYSTEM RECOMMENDATIONS

Replacement of 18,065 linear feet of existing undersized pipe in the Homewood Subdivision is recommended. The proposed project will replace undersized and leaking water mains with new 6, 8, and 12-inch water mains that will improve service, reliability and fire protection for the area.

The preliminary opinion of probable construction cost for this project is $1,216,237.50. Table 4.2.1 provides a detailed construction cost estimate for this project.

Table 4.2.1 Opinion of Probable Cost for Homewood Subdivision Water Main Replacement

ITEM NO.	ITEM	UNITS	QTY.	UNIT COST	TOTAL COST
1a	12" C900 PVC WATER MAIN	L.F.	2,690	$42.00	$112,980.00
1b	8" C900 PVC WATER MAIN	L.F.	375	$36.00	$13,500.00
1c	6" C900 PVC WATER MAIN	L.F.	15,000	$32.00	$480,000.00
2a	12" x 12" TAPPING TEE w/12" VALVE & BOX	EACH	1	$4,000.00	$4,000.00
2b	6" x 6" TAPPING TEE w/6" VALVE & C.I. BOX	EACH	17	$2,800.00	$47,600.00
2c	4" x 4" TAPPING TEE w/4" VALVE & C.I. BOX	EACH	1	$2,500.00	$2,500.00
3a	12" RESILIENT SEAT GATE VALVE & C.I. BOX	EACH	2	$2,200.00	$4,400.00
3b	6" RESILIENT SEAT GATE VALVE & C.I. BOX	EACH	35	$950.00	$33,250.00
4a	12" x 12" D.I.M.J. TEE	EACH	2	$1,000.00	$2,000.00
4b	12" x 6" D.I.M.J. TEE	EACH	3	$900.00	$2,700.00
4c	12" x 6" D.I.M.J. REDUCER	EACH	3	$500.00	$1,500.00
4d	8" x 6" D.I.M.J. REDUCER	EACH	2	$400.00	$800.00
4e	6" x 6" D.I.M.J. CROSS	EACH	4	$450.00	$1,800.00
4f	6" x 6" D.I.M.J. TEE	EACH	39	$450.00	$17,550.00
4g	6" x 4" D.I.M.J. TEE	EACH	1	$400.00	$400.00
4h	6" D.I.M.J. 90 DEGREE BEND	EACH	9	$400.00	$3,600.00
4i	6" D.I.M.J. 45 DEGREE BEND	EACH	2	$400.00	$800.00
4j	4" D.I.M.J. 90 DEGREE BEND	EACH	1	$400.00	$400.00

5	GRANULAR BACKFILL FOR OPEN CUT OF ROADS	CU. YDS.	800	$35.00	$28,000.00
6	ASPHALT PAVEMENT REPAIR FOR OPEN CUT OF ROADS	SQ. YDS.	435	$35.00	$15,225.00
7a	SHORT SERVICE CONNECTION TO NEW WATER MAIN	EACH	205	$500.00	$102,500.00
7b	LONG SERVICE CONNECTION TO NEW WATER MAIN	EACH	190	$1,100.00	$209,000.00
7c	SERVICE CONNECTION RELOCATION INTO FRONT OF HOME	EACH	27	$500.00	$13,500.00
8	WATER MAIN LOCATION WIRE	L.F.	18,065	$0.50	$9,032.50
9	STANDARD FIRE HYDRANT w/6" AUX. GATE VALVE & C.I. BOX	EACH	28	$3,900.00	$109,200.00
TOTAL CONSTRUCTION COST ESTIMATE					**$1,216,237.50**

4.3 WATER SUPPLY RECOMMENDATIONS

Well Replacement in Lafayette Well Field

Four new 800 GPM wells to replace the existing Hall, Srackengast, Tucker and Tuxford wells are recommended. The proposed project will provide a reliable water source for current and future customers.

The preliminary opinion of probable construction cost for this project is $1,225,000.00. Table 4.3.1 provides a detailed construction cost estimate for this project.

Table 4.3.1 Opinion of Probable Cost for Lafayette Well Replacements

ITEM DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST
800 GPM HALL WELL REPLACEMENT	1	$325,000.00	$325,000.00
800 GPM TUCKER WELL REPLACEMENT	1	$300,000.00	$300,000.00
800 GPM SRACKENGAST WELL REPLACEMENT	1	$300,000.00	$300,000.00
800 GPM TUXFORD WELL REPLACEMENT	1	$300,000.00	$300,000.00
TOTAL PROBABLE CONSTRUCTION COST			**$1,225,000.00**

4.4 WATER TREATMENT RECOMMENDATIONS

4.4.1 Lafayette Water Treatment Plant

A new 8.6 MGD treatment plant is recommended to replace the existing Lafayette Water Treatment Plant, which has reached end of useful life and needs to be replaced. A new Lafayette Plant will ensure that the utility continues to provide safe, reliable drinking water to current and future customers. The proposed Lafayette Water Treatment Plant would have an average design capacity of 8.6 MGD and peak capacity of 10.4 MGD. This plant could also be expanded in the future to provide additional treatment capacity.

The preliminary opinion of probable construction cost for this project is $6,190,000. Table 4.4.1 provides a detailed construction cost estimate for this project.

Table 4.4.1 Opinion of Probable Cost for Lafayette Water Treatment Plant Replacement

ITEM DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST
AERATORS WITH DETENTION TANKS	4	$225,000.00	$900,000.00
WATER TREATMENT PLANT BUILDING	1	$700,000.00	$700,000.00
1,200 GPM HORIZONTAL PRESSURE FILTERS - NEW	6	$300,000.00	$1,800,000.00
BLOWERS & AIR PIPING FOR BACKWASH	2	$60,000.00	$120,000.00
1,600 GPM HIGH SERVICE PUMPS	6	$65,000.00	$390,000.00
ELECTRICAL	1	$450,000.00	$450,000.00
ANALYZERS AND FLOW METERS	1	$40,000.00	$40,000.00
VALVES & PLANT PIPING	1	$350,000.00	$350,000.00
CHEMICAL FEED	1	$100,000.00	$100,000.00
SITE PIPING	1	$300,000.00	$300,000.00
CLEARWELL TANK	1	$900,000.00	$900,000.00
SITE IMPROVEMENTS	1	$140,000.00	$140,000.00
TOTAL PROBABLE CONSTRUCTION COST			**$6,190,000.00**

EXHIBIT REC-1

4.4.2 Wheeler Avenue Water Treatment Plant Safety Improvements

Bypass piping and demolition are recommended at the abandoned surface water treatment plant of the Wheeler Avenue Water Treatment Plant. These improvements will ensure that water service is not interrupted and that the building causes no harm due to its deteriorated condition. The existing building is in very poor condition and needs to be demolished, along with the adjacent concrete tanks. There are a number of water mains in the immediate vicinity of this building that need to be located and properly terminated prior to demolition of the building.

The preliminary opinion of probable construction cost for this project is $450,000.00. Table 4.4.2 provides a detailed construction cost estimate for this project.

Table 4.4.2 Opinion of Probable Cost for Wheeler Plant Safety Improvements

ITEM DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST
RELOCATE FINISHED WATER MAIN FROM WTP TO CLEARWELL	Lump Sum	$150,000.00	$150,000.00
DEMOLISH OLD WTP BUILDING	Lump Sum	$250,000.00	$250,000.00
LOCATION & TERMINATION OF PIPING AROUND OLD WTP BUILDING	Lump Sum	$50,000.00	$50,000.00
TOTAL PROBABLE COST			**$450,000.00**

4.5 PROBABLE TOTAL PROJECT COST

The construction cost estimates herein represent the anticipated cost of improvements based on current cost of construction. Cost estimates include the cost of materials, labor, overhead and profits for a contractor normally engaged in this type of work. Variables such as economic factors or construction contingencies could affect the final cost of improvements.

A summary of the estimated probable construction costs for the selected plan is provided in Table 4.5.1. The preliminary opinion of probable construction cost for proposed improvements is $9,081,237.50. An additional $1,362,386 in contingency, which is equal to 15% of the probable construction cost.

Table 4.5.1 Summary of Probable Construction Costs for Selected Plan

TABLE	DESCRIPTION	COST
6.2.1	Homewood Subdivision Water Main Replacement	**$1,216,237.50**
6.3.1	Lafayette Well Replacements	**$1,225,000.00**
6.4.1	Lafayette Water Treatment Plant Replacement	**$6,190,000.00**
6.4.2	Wheeler Avenue Treatment Plant Safety Improvements	**$450,000.00**
	Total Estimate of Probable Construction Cost	$9,081,237.50
	Recommended Contingency of 15%	$1,362,386.00
	Probable Construction Cost for All Projects	**10,443,623.50**

In addition, the project will also include several components that do not involve direct construction, but are necessary for planning of future construction improvements. These project components are provided in Table 4.5.2.

Hydrogeological Study for New Well Field

A preliminary budget for the hydrogeological study for the new well field from Layne Hydro is provided in Appendix D. The hydrogeological study for the new well field will require acquisition of land rights for exploration and testing, options for purchase of well field property, and possibly crop damage and temporary access improvements are not included in the Layne's budget. Significant contingency funds need to be allocated due to the nature of this work. While the overall concept plan for the hydrogeological study is well defined, the incremental findings during the investigation will require adjustments and modifications to the original plan. The recommended budget for this work is $460,000.

Water Resource Alternatives Study

Long-term water resources for the City of Anderson are critical. The hydrogeological study will identify the local resources available and allow the City to determine accurate costs for development of a new well field and water treatment facilities to replace the Wheeler WTP facility. This is expected to be a very significant investment, and it will be prudent to investigate other possible sources for water, which may include purchase from another utility. This process will require engineering investigation, legal review and financial analysis. The budget of $100,000 is intended to cover professional services necessary to analyze the alternative of purchasing water from another entity in comparison with developing a new source of supply and treatment.

Hydraulic Model of Distribution System

A computerized hydraulic model of the Anderson water distribution system is proposed to analyze storage, flow, and pressure within the existing and proposed water system. The model would be a tool for evaluating facility upgrades, allowing simulation of system modifications and impact on pressure and flow throughout the water distribution system. The computer model would be constructed using all available distribution system mapping (paper and electronic), and local knowledge of Anderson personnel. Flow and pressure testing would be conducted throughout key areas of the system to calibrate the model. Calibration is a necessary step in preparing a model to ensure the model reflects real-world conditions. The calibrated model will then be used to simulate proposed system changes, assess hydraulic constrictions, and analyze flow and pressure impacts. The water system model would be a tool for capital planning and design of proposed water system improvements. A budget of $200,000 is proposed for development of the hydraulic model of the distribution system.

Table 4.5.2 Summary of Probable Costs for Non-Construction Components of the Selected Plan

ITEM	COST
Hydrogeological Study for New Well Field	**$460,000.00**
Water Resources Alternatives Study	**$100,000.00**
Hydraulic Model of Distribution System	**$200,000.00**
Total Probable Cost of Non-Construction Components	**$760,000.00**

Total probable project costs include the cost of construction and non-construction project components, plus the non-construction expenses. Non-construction costs include items such as land, permits, fees for recording documents, engineering, construction observation, contract administration, legal, accounting, administrative, and miscellaneous items of cost. Certain cost estimates have been provided by the city's financial advisor; see Appendix C, Estimated Sources and Uses of Funds, 7/12/13, Crowe Horwath.

Table 4.5.3 provides the selected plan cost summary with estimated non-construction costs. The total estimated non-construction cost for the proposed project is $3,836,377.50. The probable estimate of total project cost for the City of Anderson's selected plan is $14,280,001.00.

Table 4.5.3 Selected Plan Estimated Cost Summary

Item	Cost
Non-Construction Costs	
Hydrological Study for New Well Field	$460,000.00
Engineering Study for Alternatives	$100,000.00
Hydraulic Model of Distribution System	$200,000.00
Land & Rights-of-way Acquisition	$0.00
Engineering Fees	
Design, Bidding & Contract Administration	$1,088,499.50
Planning	$50,000.00
Geotechnical Engineering - borings & report	$10,000.00
Project Inspection	$350,000.00
Bond Council (estimated)	$80,000.00
Rate Consultant (estimated)	$78,000.00
Regulatory Counsel (estimated)	$50,000.00
Debt Service Reserve Fund (see Crowe Horwath report)	$1,170,036.00
Miscellaneous item (see Crowe Horwath report)	$199,842.00
Non-Construction Cost Subtotal	**$3,836,377.50**
Construction Cost Subtotal	$9,081,237.50
Contingencies	$1,362,386.00
Total Estimated Project Cost	**$14,280,001.00**

EXHIBIT REC-1

4.6 PROJECT SCHEDULE

The City of Anderson filed a rate case with the Indiana Utility Regulatory Commission in April 2014. The City of Anderson is pursuing funding options, one of which is the Indiana Drinking Water State Revolving Fund Loan Program.

EXHIBIT REC-1

Appendix A:

Preliminary Source of Supply Investigation for Anderson, Indiana

April 2, 2013

Prepared by Layne

EXHIBIT REC-1

WATER · MINERAL · ENERGY

LAYNE HYDRO

A DIVISION OF LAYNE CHRISTENSEN

MEMORANDUM

TO: Lori Young, P. E., R. E. Curry and Associates

FROM: Daniel Haddock, P. E. and Samanta Lax, P. G., Layne Hydro

DATE: April 2, 2013

SUBJECT: **Preliminary Source of Supply Investigation for Anderson, Indiana**

Introduction

This memo summarizes the findings of our preliminary investigation of potential sources of additional water supply for the City of Anderson (the City). The goal of the City is to increase their capacity to supply water to the southwest service territory near Interstate 69 to serve existing and proposed industrial development. The objective of this investigation was to identify areas within the City and to the west with the potential for development of 6 to 8 million gallons per day (mgd) of water supply capacity. After analysis of the available information, we identified three areas with apparent potential. Confirmation of feasibility will require further investigation and testing to verify the geology and evaluate the hydrological characteristics of the identified areas. Included in this memo is a brief explanation of the hydrogeological setting of the area surrounding the City, identification and preliminary assessment of the areas of interest, and recommendations for the additional investigation and analysis necessary to confirm the availability and quality of water.

Hydrogeological Setting

The City is located in the upper reaches of the White River basin. The White River is the main drainage in the area surrounding the City (Figure 1). The southernmost area of the City is part of the Fall Creek drainage area. In general, surface water in the region flows to the southwest, down dip from the western flank of the north-northwest strike Cincinnati Arch [1]. The northern part of the White River basin lies within the Tipton Till Plain, a low-relief plain comprised of glacial deposits overlying limestone bedrock. In areas where glacial meltwater carved valleys in the bedrock the glacial deposits are thicker. Areas of unweathered bedrock generally occur at higher elevations and are topped by thinner glacial deposits. In general, sand and gravel deposits are found within the bedrock valleys, as glacial-fluvial deposits and along

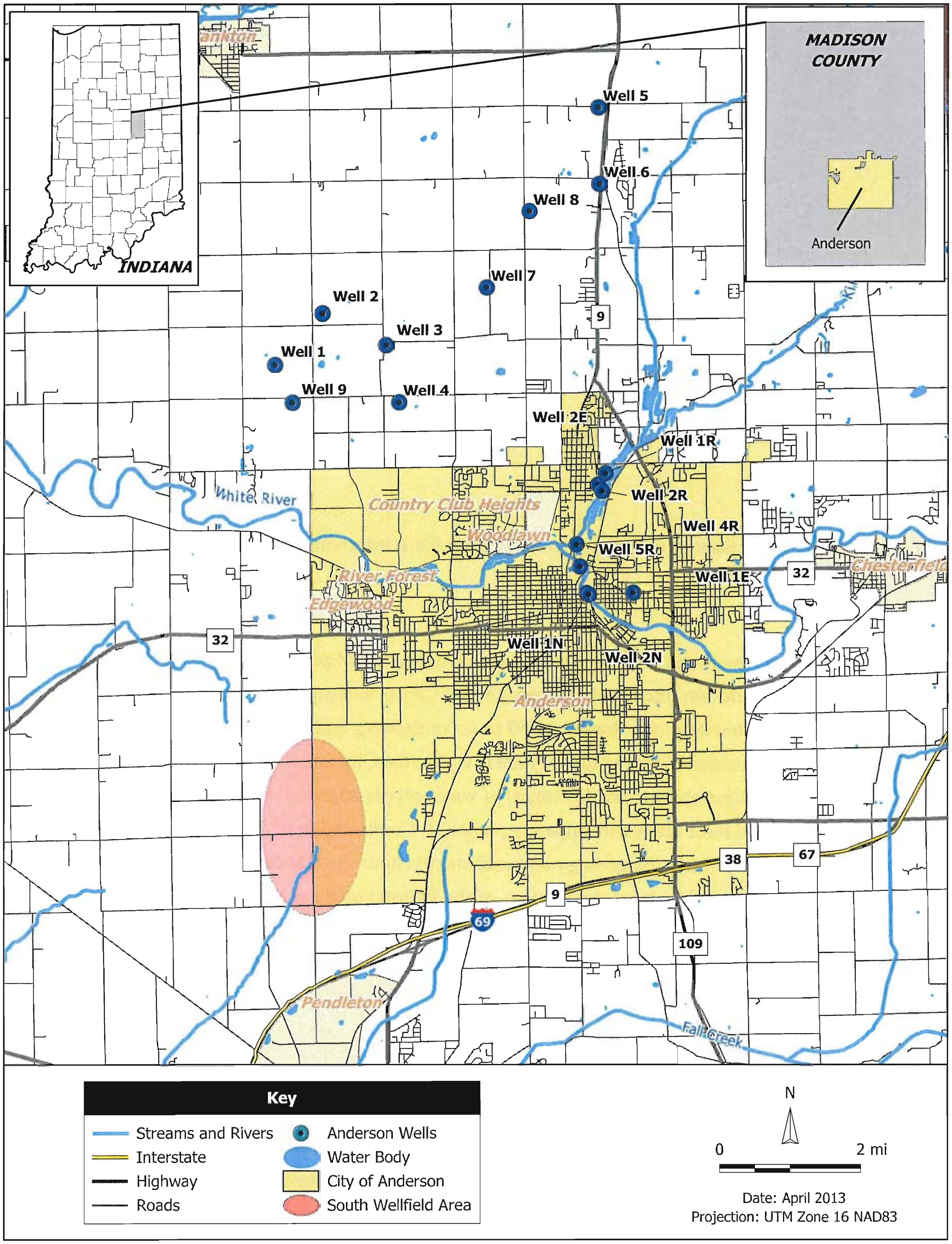


Figure 1: Location map for the City of Anderson and existing City water supply wells. The South Well Field Area was identified by the City as an area of preliminary interest due it's proximity to industrial development.

modern river channels [1]. Sand and gravel aquifers in the Tipton Till Plain tend to be relatively thin and discontinuous, which limits recharge and the sustainable yield of those aquifers. The *South Well Field Area* shown in Figure 1 was identified by the City as an area of preliminary interest; it is characterized by these types of formations. Locally, areas with relatively thick intervals of sand and gravel may be found, but because they are discontinuous recharge and sustainable yield is very limited. The greatest potential for yields of 6 to 8 mgd is in the White River Outwash Aquifer System in locations where the relative location and depth of the sand and gravel aquifers with respect to the White River may permit induced recharge from the river to the aquifer.

Figure 2 shows the location of existing high-capacity wells owned by the City and others, as well as the transects for three geologic cross-sections. Figure 3 shows bedrock elevation contours. The cross-sections A-A' (Figure 4), B-B' (Figure 5), and C-C' (Figure 6) were constructed with well logs from the Indiana DNR's Water Well Record database [2].

Analysis

We focused our analysis on identifying areas that may have the characteristics required to allow recharge from the White River via river bank filtration (RBF). Well fields developed in areas with characteristics conducive to RBF will have the greatest potential to sustainably yield 6 to 8 mgd. Through our review of geological maps and existing well logs, we identified areas with the following combination of general characteristics:

- within 1,000 ft of the White River
- bedrock elevation a minimum of 75 ft below typical water levels in the White River
- evidence of relatively thick sand and gravel aquifer material, with the top of the aquifer near the elevation of the White River
- static water levels in the aquifer that are comparable to typical water levels in the White River, suggesting some degree of hydraulic connection

Based on these criteria, three areas were identified for further investigation and are shown in Figure 7.

Area 1 This area is located to the west of the City, near the intersection of West Cross Street (County Road 200N) and Hamilton Road (County Road 600W), and along a 1-1/2 mile reach of the White River (Figure 8). Well logs in this area indicate that the best potential for finding adequate aquifer material is to the north of the White River.

Area 2 This area is located on both sides of a 1-1/2 to 2 mile reach of the White River, extending east and west of the alignment of Layton Road (Figure 9).

Area 3 This area is located on both sides of a 2 to 2-1/2 mile reach of the White River, in the vicinity of the Grandview Country Club (Figure 10).

The three areas shown in Figures 8 to 10 are approximate, and were delineated based on information contained in Indiana DNR well logs. Driller's well logs are sometimes inconsistent; interpretation and recording of geology may have been completed with varying levels of care. Field investigation is required to confirm the geology and verify that a particular location is suitable for the desired purpose.

Existing well fields In conjunction with exploration for new well fields, the City may consider evaluating the potential for additional yield from existing well fields. Extended pump testing with existing wells and groundwater modeling could be used to evaluate the sustainable yield of the aquifers under normal and drought conditions and to identify opportunities to optimize the location and operation of existing and future wells to maximize available yields. If it is feasible to develop additional sustainable yield at the existing well fields, the scope and cost of exploration, land acquisition, and development of new well fields may be reduced.

Recommendations

We recommend further investigation of one or more of the identified areas. The next stage of investigation in these areas should include the following activities:

- Review property records to identify accessible, appropriate sites for investigation
- Negotiate property access, or purchase option / property access agreements
- Screen sites and select locations for test borings by performing geophysical surveys (resistivity and seismic) to confirm bedrock depth and evaluate relative thickness and depth of clay, sand and gravel materials
- Drill small diameter test borings at selected locations to characterize the subsurface geology and identify locations for test wells
- Construct test and monitoring wells and perform extended period pump tests of 72 hours or more to estimate aquifer parameters, evaluate recharge, and analyze water quality
- Use groundwater model to evaluate sustainable yield, water quality, and impacts to existing residential wells

We also recommend that as part of the effort to increase water supply capacity that the City's existing well fields be evaluated to determine if additional sustainable yield could be obtained at those locations. Evaluation of the potential for optimization of yields from existing supplies could be accomplished by groundwater modeling, with testing of existing wells to obtain the data required for model calibration.

We appreciate the opportunity to support these efforts to plan the infrastructure necessary to sustain economic development in Anderson and look forward to discussing our analysis and recommendations with you in the near future.

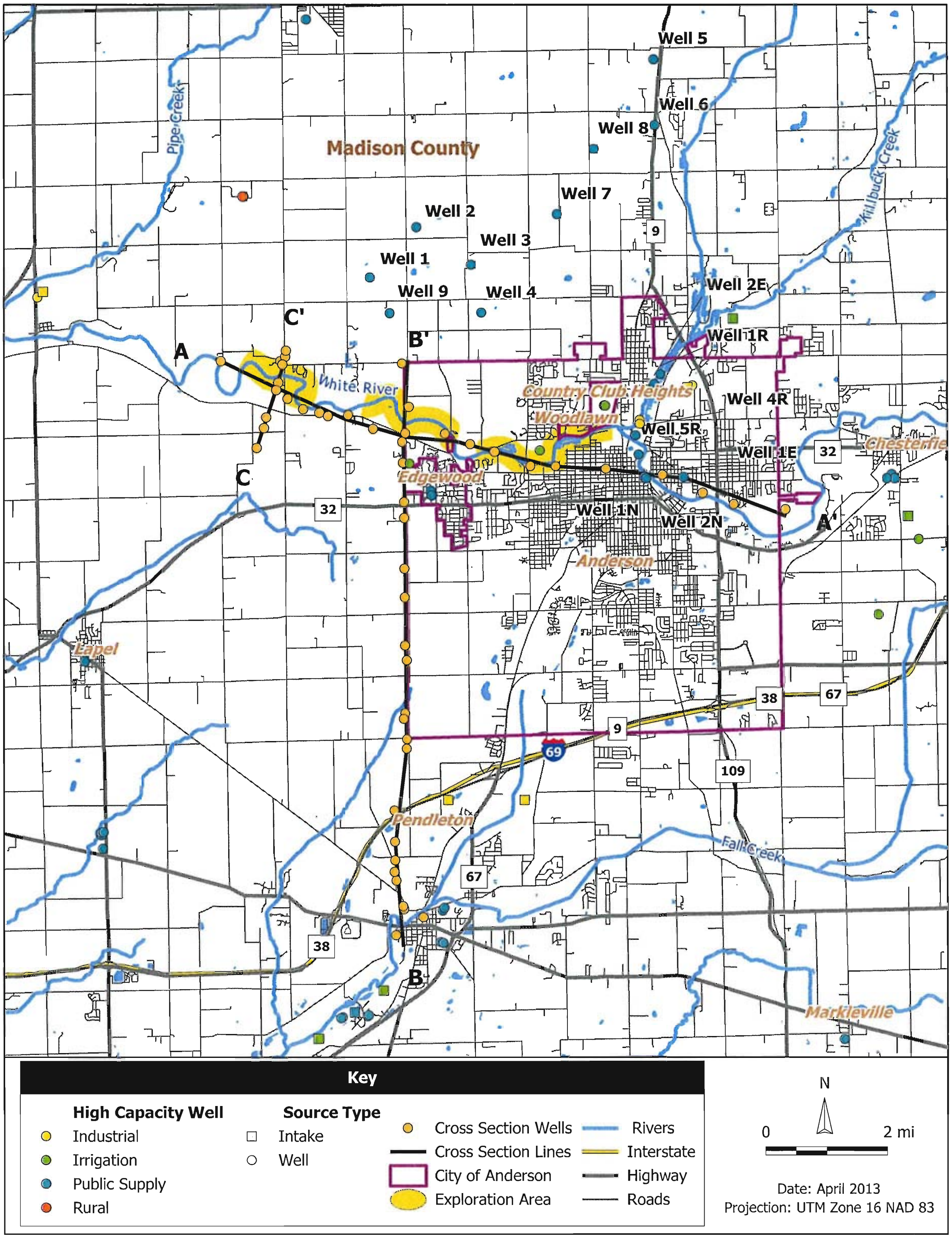


Figure 2: Existing high-capacity water withdrawal facilities and cross-section transects A-A', B-B' and C-C'. Source: Indiana DNR [3].

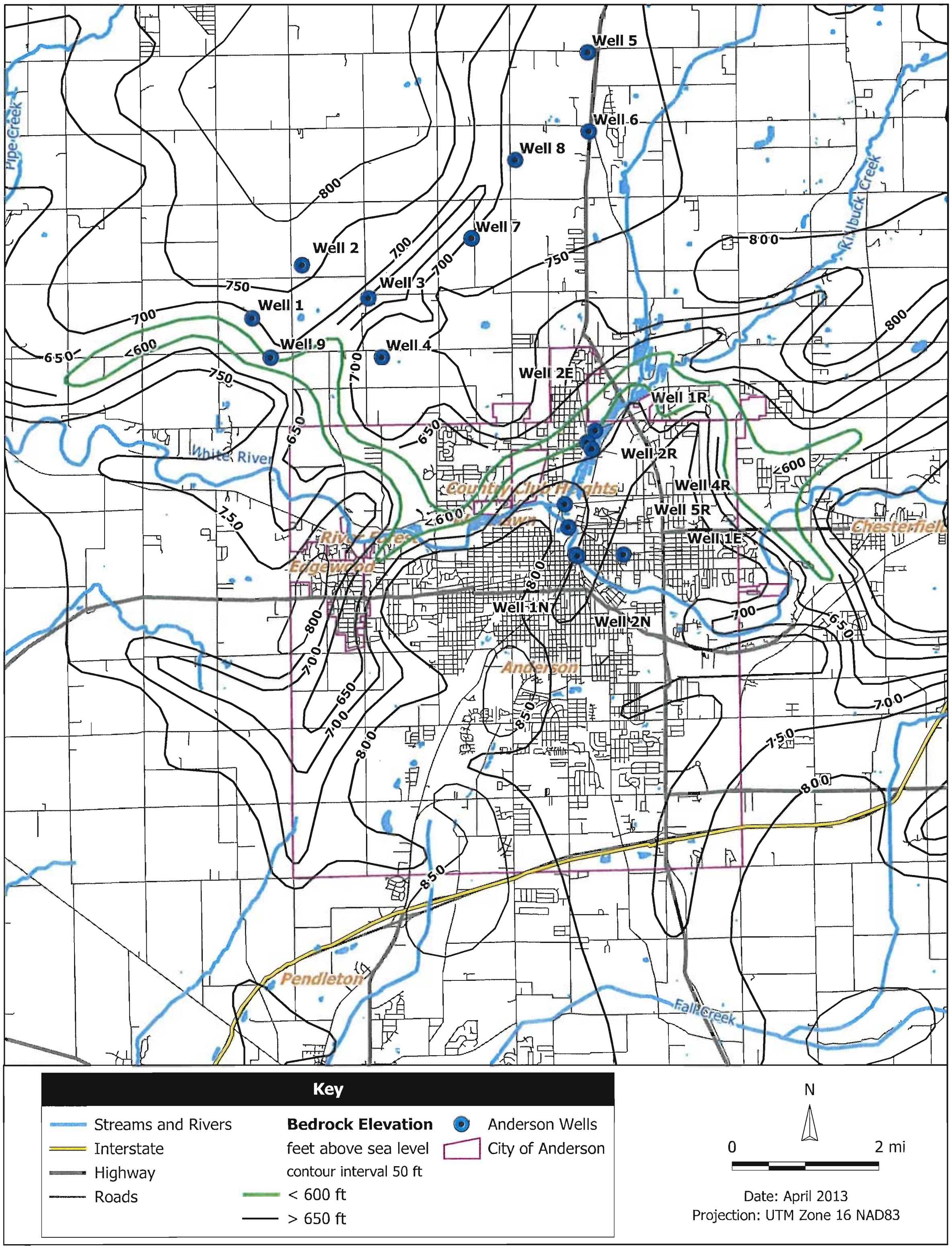


Figure 3: Bedrock elevation and existing City of Anderson water supply wells. Source: Indiana DNR [3].

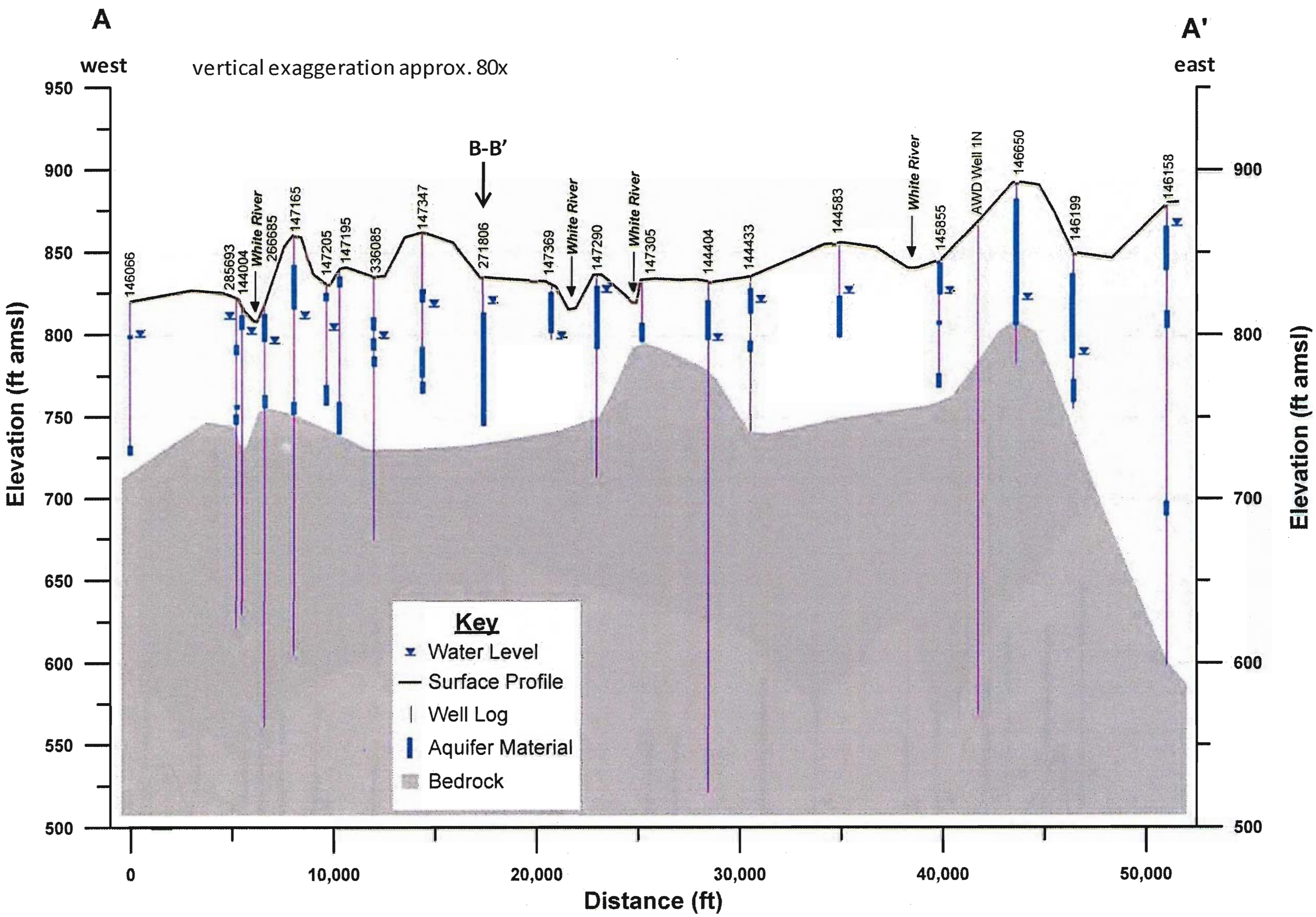


Figure 4: Cross-section A-A' extending generally west to east along the White River.

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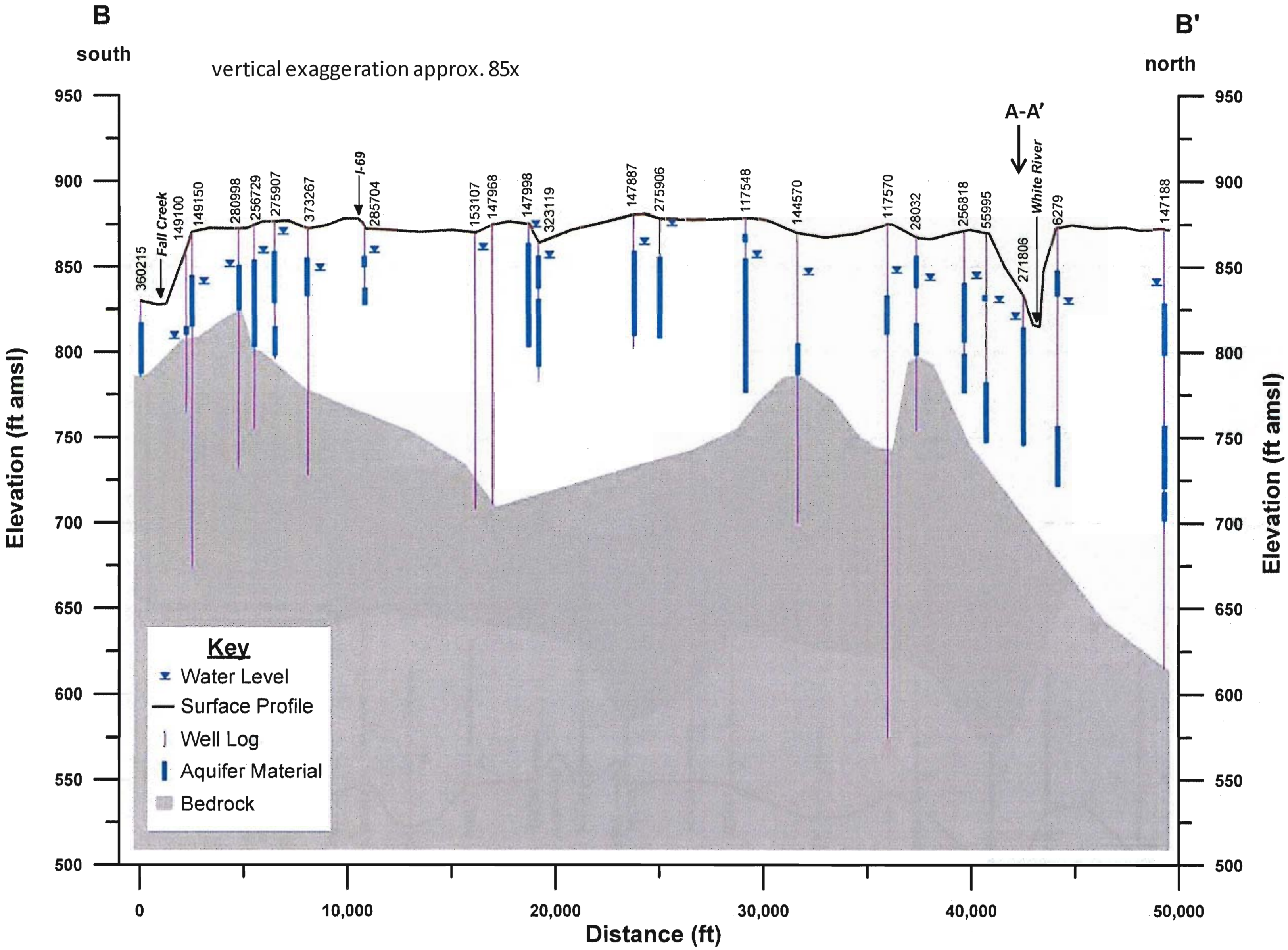

Figure 5: Cross-section B-B' extending along the west edge of the City from Fall Creek (south) to the White River (north).

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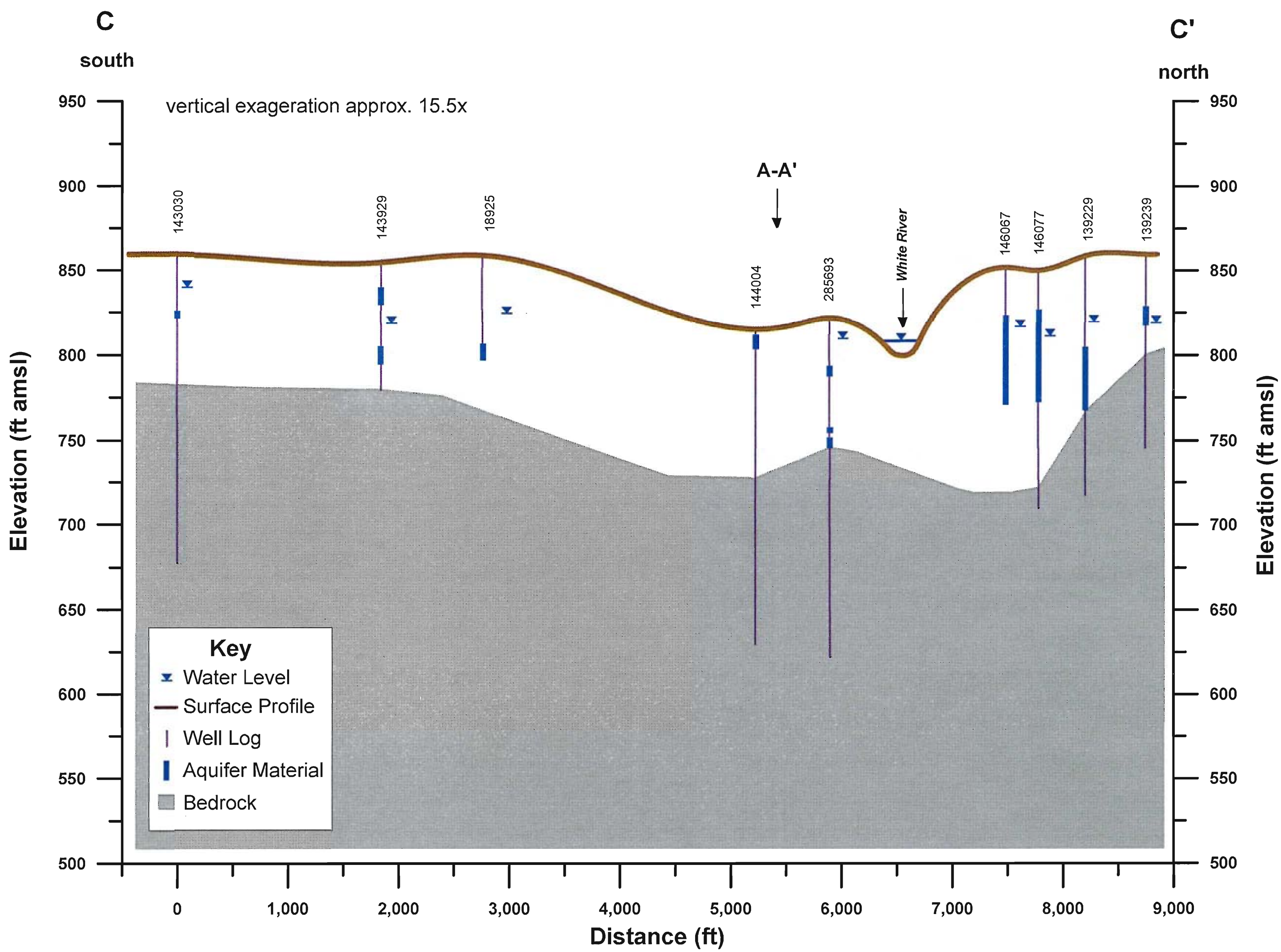

Figure 6: Cross-section C-C' extending from the south to the north of the White River west of the City.

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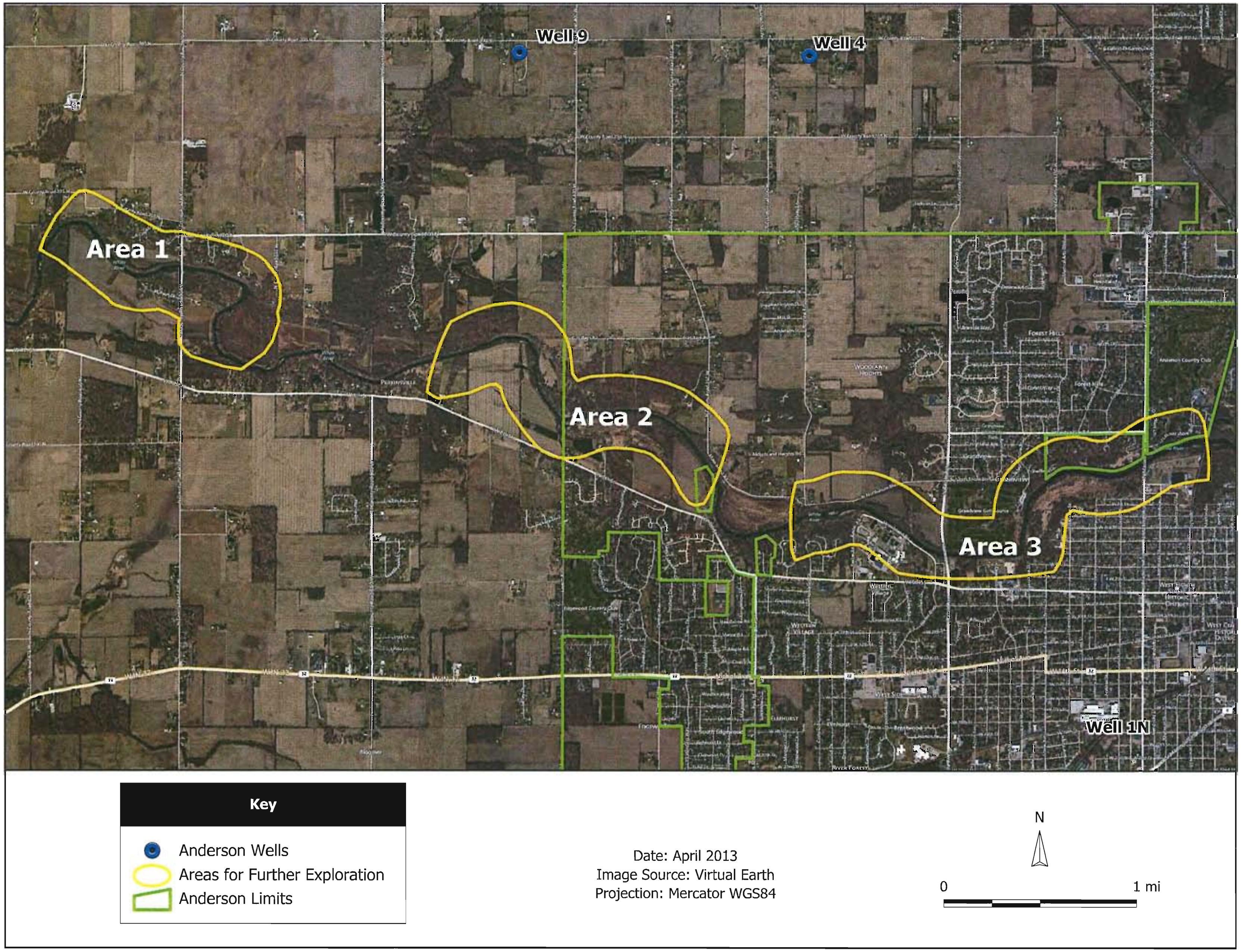

Figure 7: Location of the three areas recommended for further exploration.

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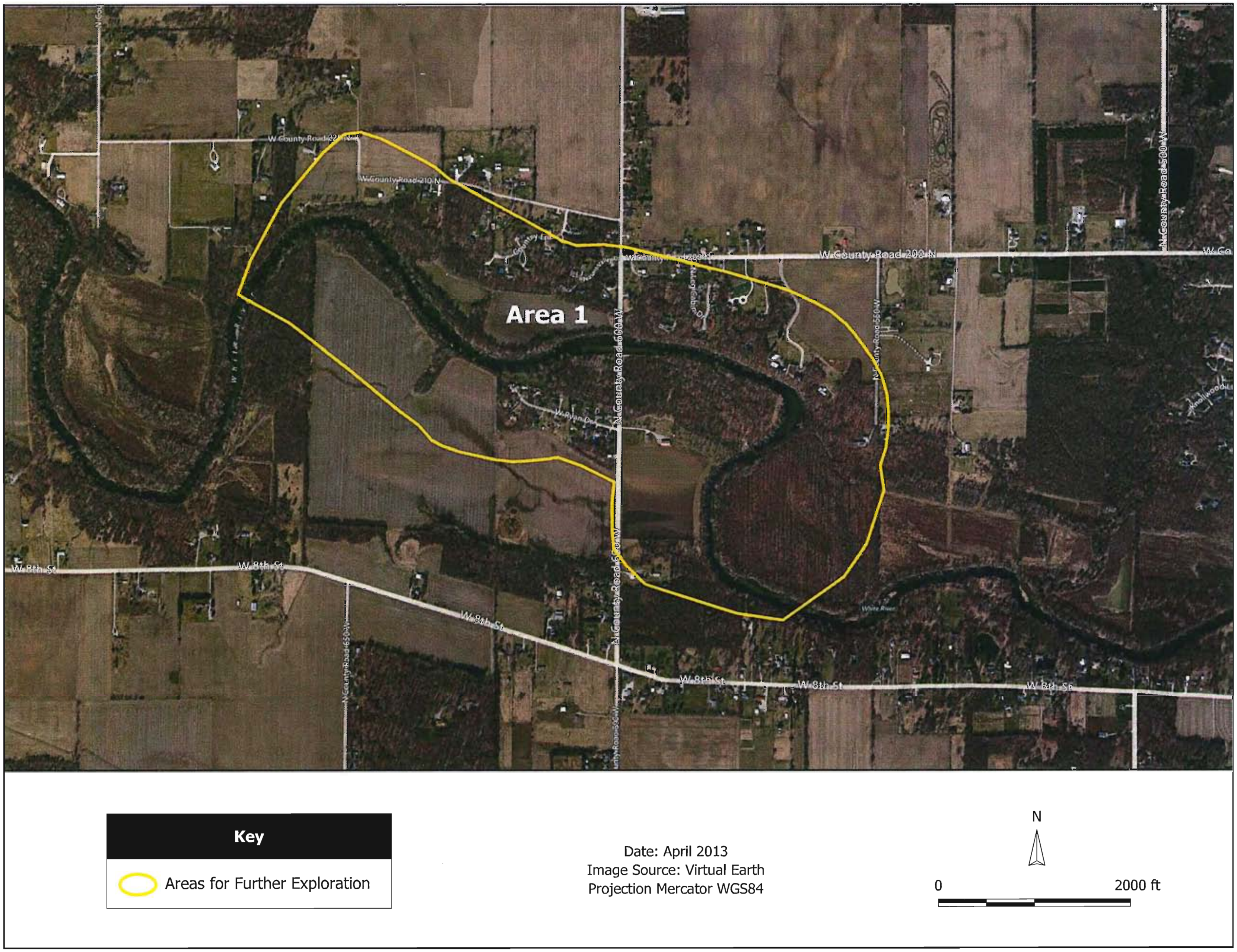

Figure 8: Location of recommended exploration area 1.

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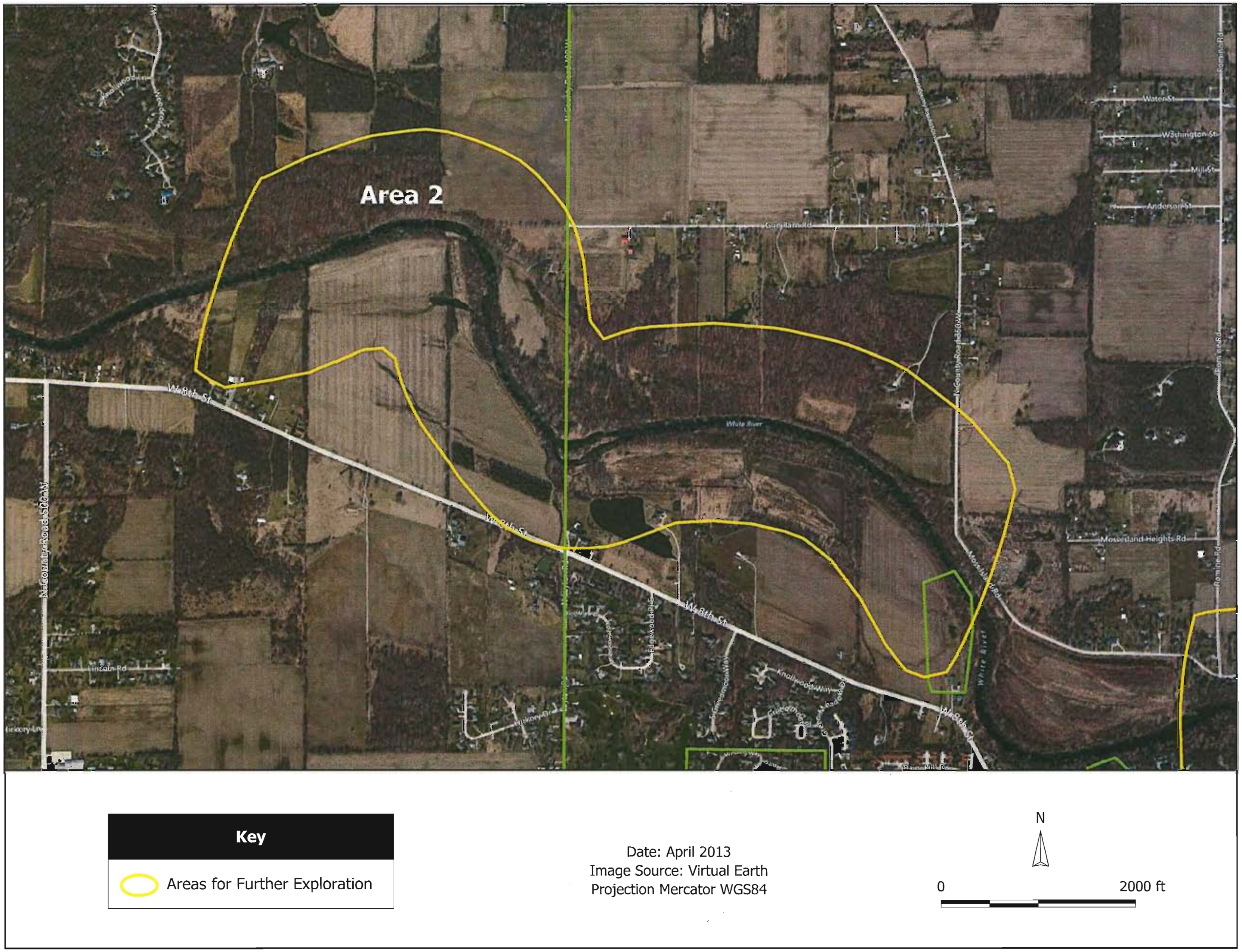

Figure 9: Location of recommended exploration area 2.

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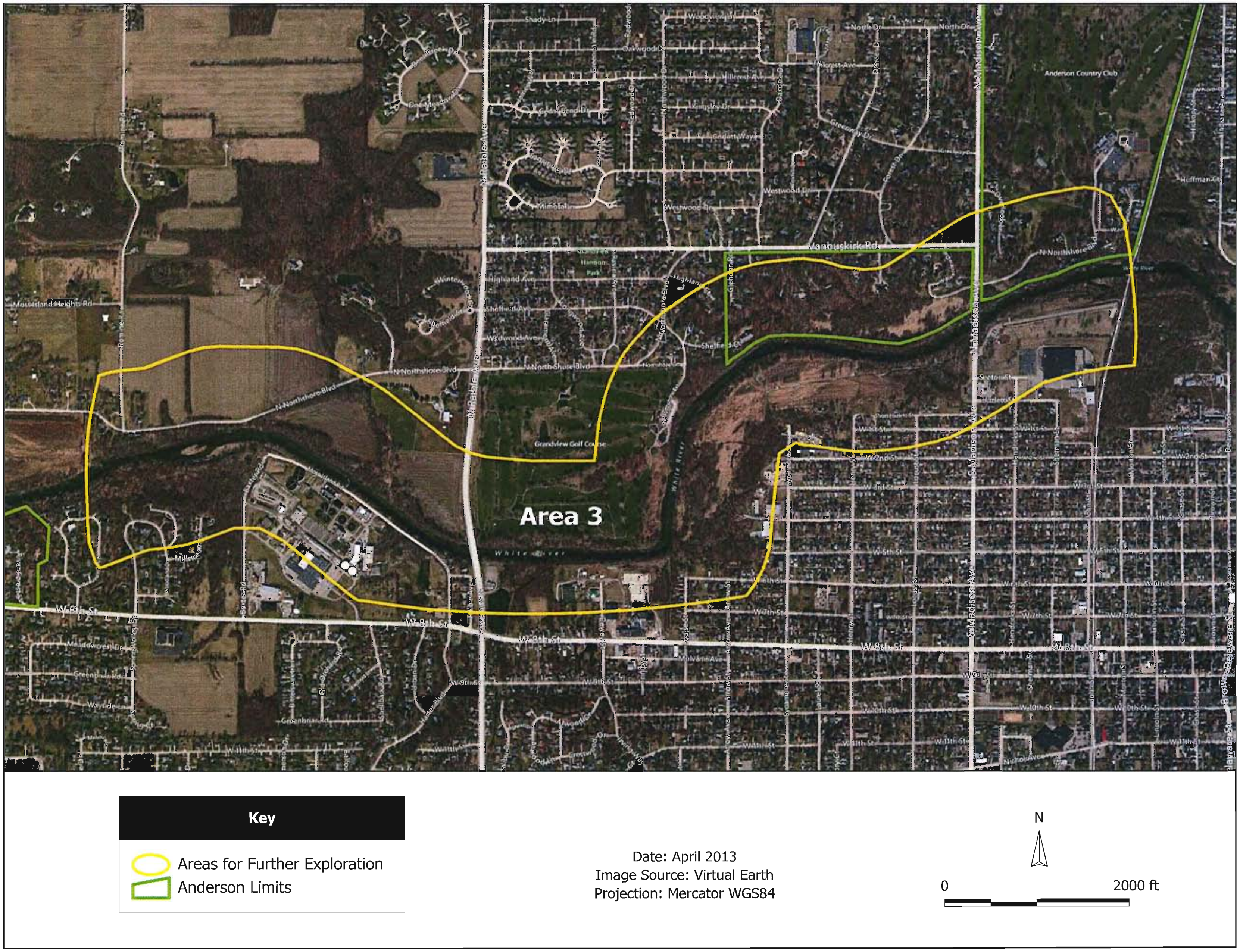

Figure 10: Location of recommended exploration area 3.

EXHIBIT REC-1

References

[1] Fenelon, Joseph M., and Bobay, Keith E., and others, 1994. Hydrogeologic Atlas of Aquifers in Indiana.US Geological Survey Water-Resources Investigation Report 92-4142.

[2] Water Well Record Database. Indiana Department of Natural Resources. Visited Mar 2010. Available at: http://www.in.gov/gis-dnr-web/website/DNR_WaterWells_II/viewer.htm

[3] ILITH Water-Well Database. Indiana Geological Survey. Visited Mar 2010. Available at: http://inmap.indiana.edu/metadata/clay_ilith_in.html

Appendix B:

Evaluation of Groundwater Availability near Existing Well Fields

November 4, 2013

Prepared by Layne

Evaluation of Groundwater Availability near Existing Well Fields

CITY OF ANDERSON WATER DEPARTMENT

November 4, 2013

Prepared by
Layne Hydro
a division of Layne Christensen Company
Bloomington, Indiana

EXHIBIT REC-1

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1 Introduction

The City of Anderson (City) is investigating options for upgrading its water supply, including future expansion of up to 6 to 8 million gallons a day (mgd). In April 2013, Layne completed a preliminary investigation which identified locations along the White River in and around the City with the potential to develop a new high-capacity well field. The City subsequently contracted Layne to evaluate the existing well fields and to assess the potential for their expansion.

The City's operates two existing well fields in and around Anderson. The Lafayette Well Field, located north and northwest of the City limits, consists of 9 vertical wells. The Wheeler Well Field, located along the White River and Killbuck Creek in the north part of the City, consists of four Ranney collector wells and four vertical wells (Figure 1). The average annual production of the two well fields together total approximately 9 to 9.5 mgd.

The focus of the present study was revised slightly mid-project. Early in the project, we delivered a memorandum (Appendix A - Memorandum) identifying areas of potential water supply investigation. The memo was used by the City's engineering consultants to evaluate and compare the benefits and probable costs of alternatives for rehabilitation and expansion of existing supply and treatment infrastructure at the Wheeler and Lafayette well fields. Based on this evaluation, the City determined that efforts to upgrade existing facilities would be focused on the Lafayette source of supply. To optimize the utilization of the Lafayette treatment plant capacity, a minimum of 8.3 mgd reliable supply is required. As a result, modeling to estimate potential for expansion was focused on the Lafayette well field.

We would like to acknowledge the cooperation and support of the City of Anderson Water Department and R.E. Curry and Associates in facilitating the collection of field data and obtaining information necessary for our analysis.

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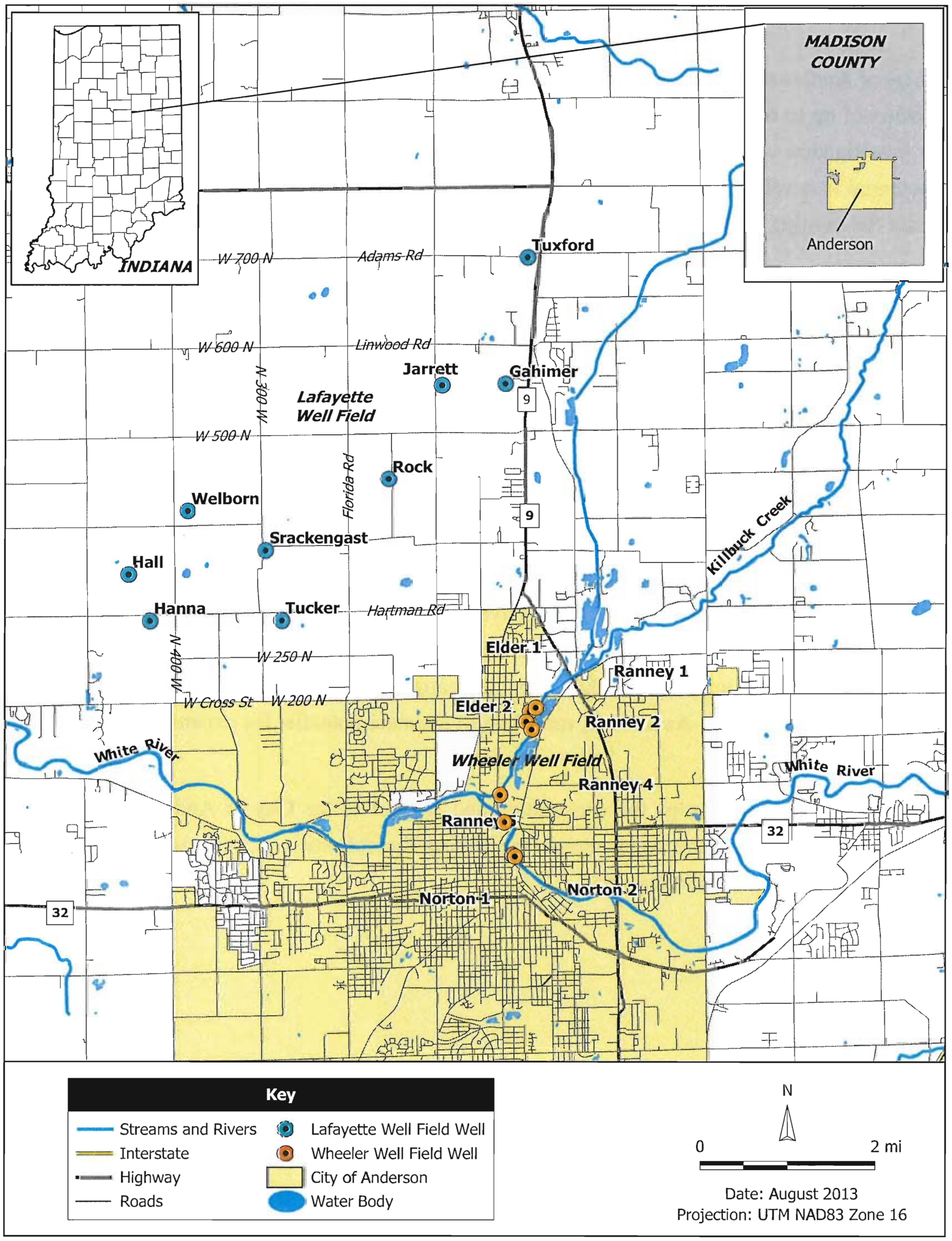

Figure 1: Location of the Lafayette and Wheeler well fields.

2 Objectives

The general objective of this project was to evaluate data on the existing wells in the Lafayette and Wheeler well fields and to estimate the potential for expanding existing well field capacity. Specific objectives were as follows:

- Provide preliminary analysis to support evaluation of water supply options by the City and their consultants
- Estimate the additional sustainable yield and potential for expansion of the Lafayette well field
- Review and comment on proposed well replacement in the Phase I Capital Improvement Plan by R.E. Curry and Associates
- Provide recommendations for further development of the Lafayette well field

3 Background Information

3.1 Hydrogeologic settings

Anderson is located in the upper reaches of the White River basin. The White River is the main drainage in the area. In general, surface water in the region flows to the southwest, down dip from the western flank of the north-northwest strike Cincinnati Arch [1]. The northern part of the White River basin lies within the Tipton Till Plain, a low-relief plain comprised of glacial deposits overlying limestone bedrock. In areas where glacial meltwater carved valleys in the bedrock the glacial deposits are thicker. Areas of unweathered bedrock generally occur at higher elevations and are topped by thinner glacial deposits. In general, sand and gravel deposits are found within the bedrock valleys, as glacial-fluvial deposits and along modern river channels [1]. Sand and gravel aquifers in the Tipton Till Plain tend to be relatively thin and discontinuous, which may limit recharge and the sustainable yield of those aquifers. Locally, areas with relatively thick intervals of sand and gravel are found, but because in certain areas they are discontinuous recharge and sustainable yield can be limited.

3.1.1 Wheeler Well Field Area

The area near the well field has approximately 150 ft of unconsolidated thickness. Review of well logs suggests that the unconsolidated material in the area surrounding the confluence of Killbuck Creek and Little Killbuck Creek is predominantly clay, and that residential wells in this area are completed in bedrock. The gravel deposits mined in the area appear to be shallow and confined to areas near the creeks, where shallow sand and gravel aquifers are found. Aquifer materials are thin and highly variable. Previous reports have indicated that recharge is limited along Killbuck Creek, and better along the White River. The Elder Wells are vertical wells, approximately 100 feet deep and completed in sand and gravel aquifers near Killbuck Creek. The collector wells are less than 50 feet deep, located near Killbuck Creek and the White River. The Norton Wells are located near the White River but are completed in bedrock, with depths of approximately 300 feet.

3.1.2 Lafayette Well Field Area

The Lafayette well field is located over a bedrock valley with unconsolidated deposits of approximately 150 feet in thickness. At the southern end of the well field, unconsolidated deposits can be up to 300 feet thick. Thin sand and gravel layers of limited lateral extent are spread throughout the area and are used as a source of water supply by private wells. The City's wells are screened in deeper and thicker layers of sand and gravel, generally towards the bottom of the unconsolidated deposits. The areas within the well field with greatest potential for additional yield exist in areas with significant thickness (greater than 100 feet) of unconsolidated material (Figure 2).

Figure 3 shows the location of existing wells in the Lafayette Well Field and transects for two cross-sections. The cross-sections A-A' and B-B' (Figures 4 and 5, respectively) were constructed with information from the well logs provided by the City. Reported bedrock elevations near the wells were confirmed with information from the Indiana DNR's Water Well Record database [2]. Ground elevations at the City's wells were obtained using a high-grade GPS unit.

Ground elevation within the Lafayette Well Field varies from approximately 906 feet above mean sea level (ft amsl) near the Gahimer well to approximately 875 ft amsl near the Hanna well in the southwest area of the well field. In the Anderson area, the elevation of the White River varies from approximately 825 ft amsl near the confluence with Killbuck Creek to approximately 818 ft at a location south of the Hanna well. Aquifers and confining units within the unconsolidated material are highly variable; there is no well-defined aquifer thickness and limits.

Our analysis relies on data from the City's production well logs, existing water well logs from the Indiana DNR database and observations during data collection at the Lafayette Well Field.

3.2 Existing wells

3.2.1 Wheeler Well Field

The Wheeler Well Field pre-dates the Lafayette Well Field and currently consists of four Ranney collector wells, two vertical sand and gravel wells, and two vertical rock wells. Originally, there were six collector wells, two of those were removed from service in the 1970's due to contamination. Basic data for the Wheeler wells is summarized in Table 1.

The well screen laterals of the four collector wells were last cleaned 15 to 20 years ago, and fouling of the screens has resulted in loss of yield. Ranney Collector Wells 1 and 2 (R1 and R2) are located adjacent to Killbuck Creek, are completed in relatively thin aquifer formations with limited recharge. In 2007, an evaluation of these wells estimated that there was little potential to increase the yield of R1, and that the yield of R2 could be increased by 300 to 900 gallons per minute (gpm) with the installation of new lateral well screens (CITE RANNEY). Ranney Collector Wells 4 and 5 (R4 and R5) receive recharge from the adjacent White River, and have greater potential for increased yields. The 2007 evaluation estimated that with cleaning and redevelopment of existing lateral well screens or projection of new lateral well screens, the yields of R4 and R5 could be increased by up to 500 gpm and 700 gpm, respectively.

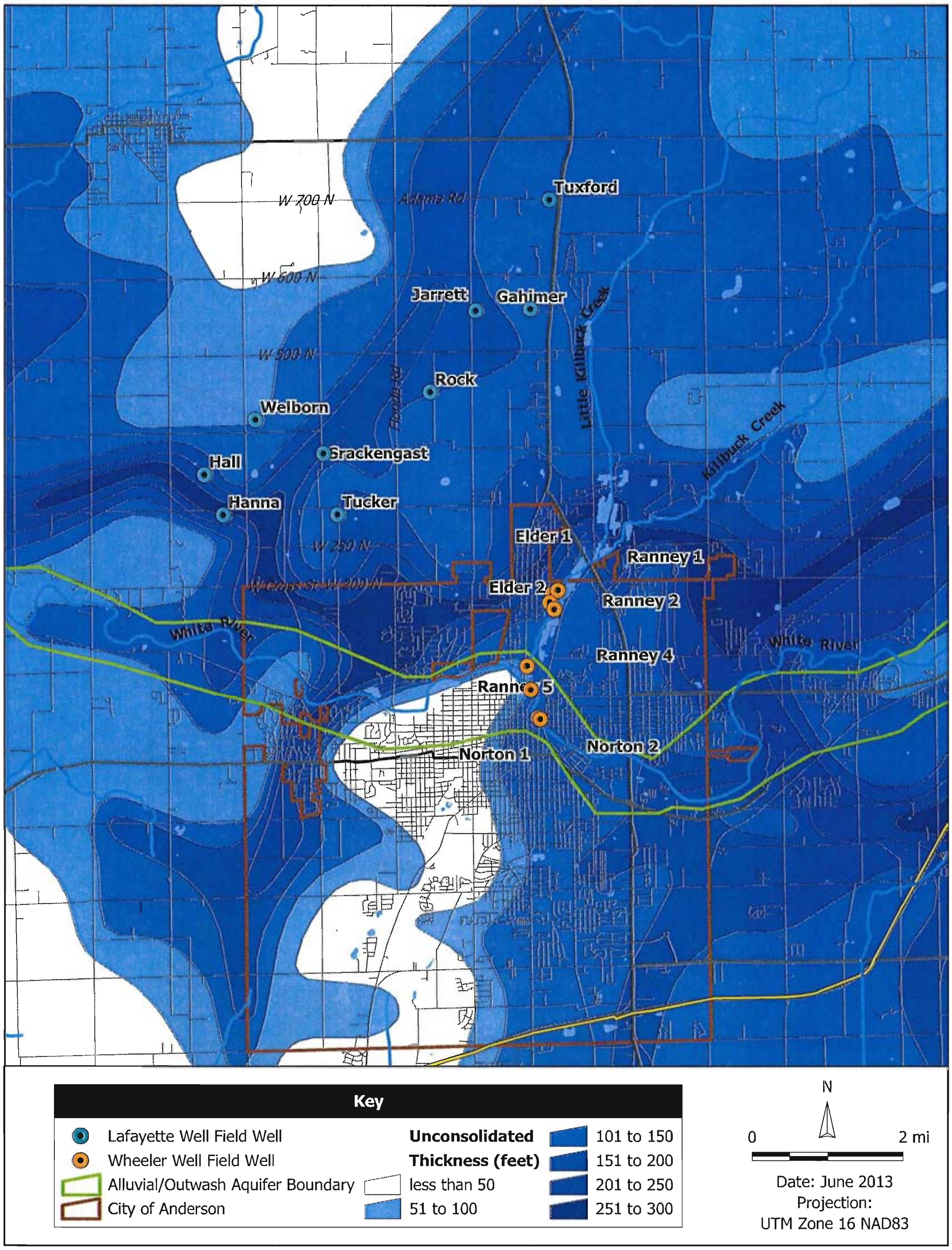

Figure 2: Thickness of unconsolidated deposits near Anderson.

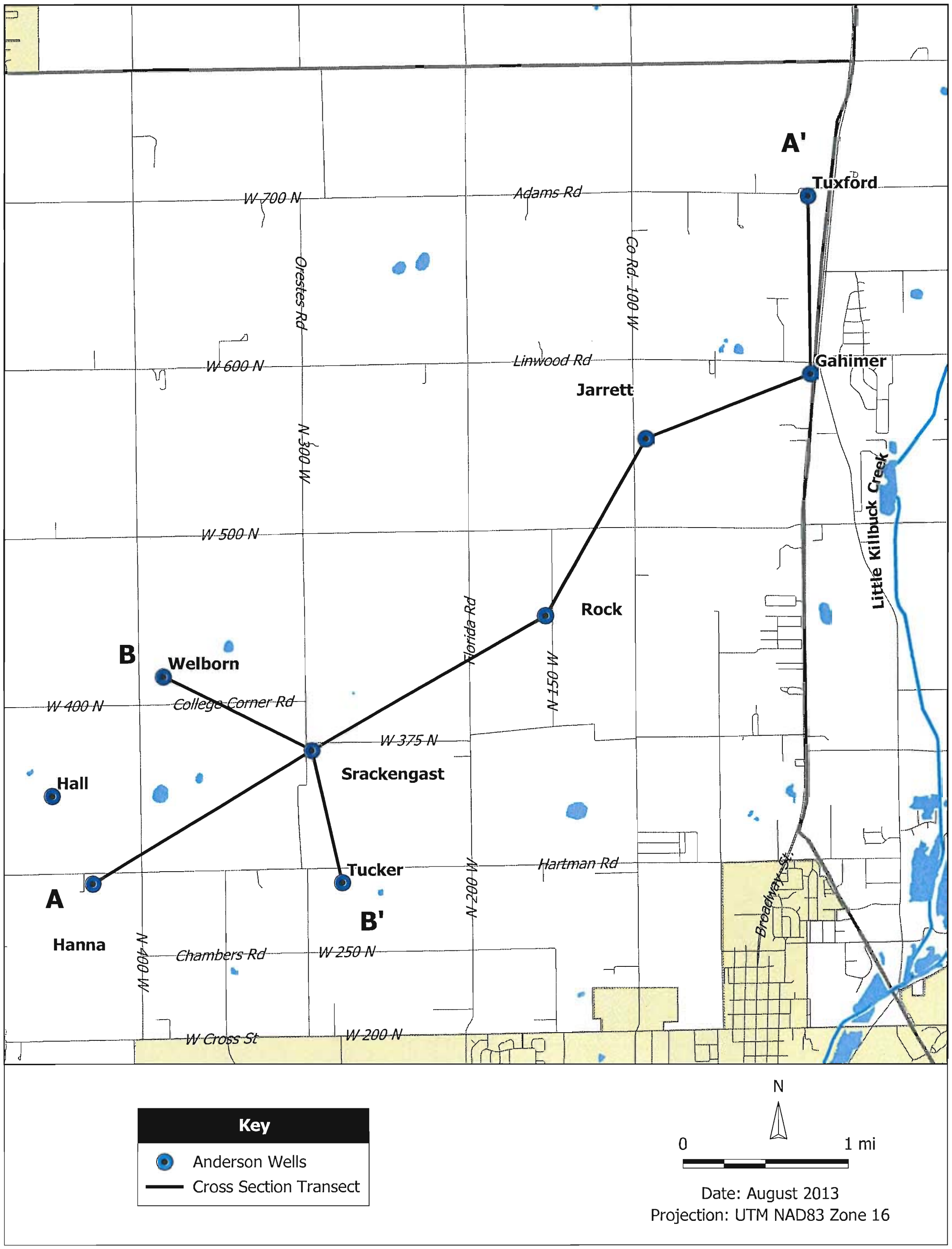

Figure 3: Cross section transects of the Lafayette Well Field.

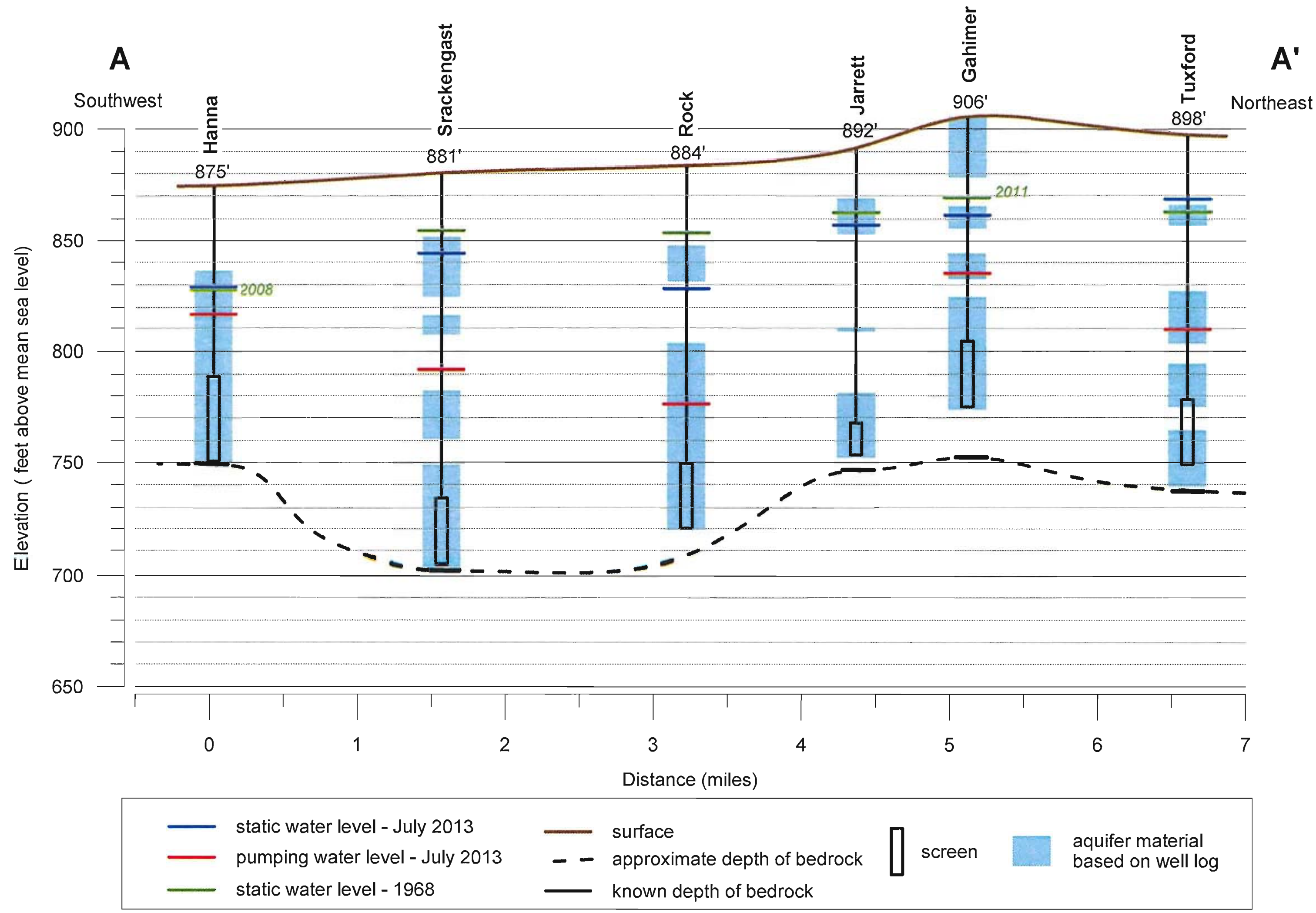

Figure 4: Cross section AA'.

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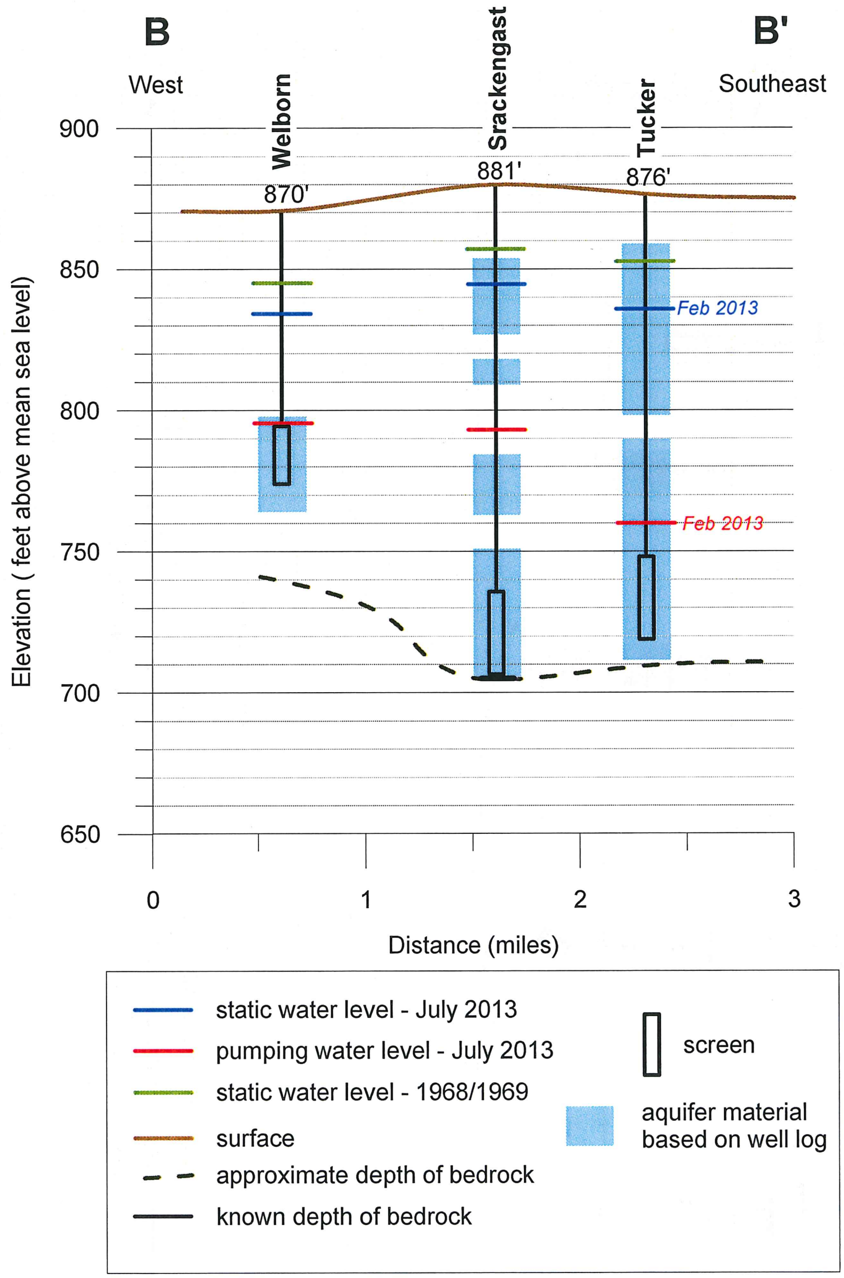

Figure 5: Cross section BB'.

Table 1: Characteristics of existing wells in the Wheeler well field.

Name	Well Number	Year Built	Depth (ft bgl)	Screen Range (ft bgl)	Elevation Approx. (ft amsl)	Casing/ Screen Diameter (inches)	Installed pump capacity (gpm)	Reported pumping capacity (gpm)	Original Specific Capacity (gpm/ft)	Recent Specific Capacity (gpm/ft)
Ranney 1	R1	1947	50	laterals	840	caisson	1200	767	-	-
Ranney 2	R2	1947	37	laterals	838	caisson	1750	1187	-	-
Ranney 4	R4	1947	35	laterals	837	caisson	1200	1075	-	-
Ranney 5	R5	1957	49	laterals	839	caisson	1200	917	-	-
Elder 1	E1	2007	115	79 - 97	842	24	1000	578	20.2	19.2 (2012)
Elder 2	E2	2009	105	93 - 104	838	24	700	726	63.2	50.4 (2012)
Norton 1	N1	1910	300	open hole	845	10	500	-	-	-
Norton 2	N2	1910	300	open hole	845	10	500	-	-	-

ft bgl = feet below ground level; ft amsl = feet above mean sea level

gpm = gallons per minute; gpm/ft = gallons per minute per foot of drawdown.

3.2.2 Lafayette Well Field

The Lafayette Well Field was constructed beginning in 1967 and currently consists of nine vertical sand and gravel wells. Basic data for the Lafayette wells is summarized in Table 2.

Table 2: Characteristics of existing wells in the Lafayette well field.

Name	Well Number	Year Built	Depth (ft bgl)	Screen Range (ft bgl)	Elevation toc (ft amsl)	Casing/ Screen/ Liner Diameter (inches)	Installed pump capacity (gpm)	Reported pumping capacity (gpm)	Original Specific Capacity (gpm/ft)	Recent Specific Capacity (gpm/ft)
Hall	1	1967	198	168 - 198	869.8	42/30/18	800	433	50.2	5.8 (2012)
Welborn	2	2002	106	76 - 96	869.0	16/16	1400	633	50.6	33.1 (2013)
Srackengast	3	1968	176	146 - 176	880.6	42/30/24	1400	421	35.4	9.1 (2013)
Tucker	4	1969	157	127 - 157	876.0	42/30/24	1400	421	55.3	12.3 (2013)
Tuxford	5	1969	149	119 - 149	898.0	42/30/16	800	495	33.9	14.1 (2013)
Gahimer	6	2011	132	101 - 131	906.0	24/24	800	-	31.2	26.3 (2013)
Jarrett	7	1969	141	124 - 139	892.0	42/30	-	-	18.5	-
Rock	8	1969	164	134 - 164	884.0	42/30/18	1000	672	80	10.0 (2013)
Hanna	9	2009	120	85 - 125	874.7	24/24	1400	881	-	110.1 (2012)

*toc = top of casing; ft bgl = feet below ground level; ft amsl = feet above mean sea level; * at time of construction;*

gpm = gallons per minute; gpm/ft = gallons per minute per foot of drawdown.

EXHIBIT REC-1

EXHIBIT REC-1

4 Analysis

Our analysis included evaluation of well construction records, maintenance records and operational data provided by the City, as well as field data collected during operation of the Lafayette well field, significant water withdrawal data and geologic and well construction logs obtained from Indiana DNR, and other existing reports. This analysis provided the basis for groundwater modeling to estimate the potential yield of the Lafayette well field, and informed our conclusions and recommendations.

4.1 Historical well performance

Production and maintenance records were reviewed and analyzed to evaluate trends in water levels, well performance (specific capacity), and maintenance in the Wheeler and Lafayette well fields.

4.1.1 Wheeler

The Wheeler Well Field consists of four Ranney collector wells, two vertical sand and gravel wells, and two vertical rock wells. Ranney Collector Wells 3 and 6 were abandoned in the 1970's due to groundwater contamination.

Ranney Collector Well 1 Ranney Collector Well 1 was constructed in 1947. The well has nine horizontal lateral screens in three tiers. This well produced 12% of the total raw water for the Wheeler plant in 2012. The installed pump capacity is reported to be 1,200 gpm. The most recent flow test (2007) reported a pumping rate of 767 gpm at 222 ft TDH, with a static water level of 35.8 ft. This well has been classified by IDEM as under the direct influence of surface water, based on a previous micro-particulate analysis. The low-carbon well screens have exceeded the typical 40 year service life of this type of screen.

Ranney Collector Well 2 Ranney Collector Well 2 was constructed in 1947. The well has 14 horizontal lateral screens in three tiers. This well produced 7% of the total raw water for the Wheeler plant in 2012. The installed pump capacity is reported to be 1,750 gpm. The most recent flow test (2007) reported a pumping rate of 1,187 gpm at 202 ft TDH, with a static water level of 39.0 ft. The low-carbon well screens have exceeded the typical 40 year service life of this type of screen.

Ranney Collector Well 4 Ranney Collector Well 4 was constructed in 1947. The well has 12 horizontal lateral screens in two tiers. This well produced 10% of the total raw water for the Wheeler plant in 2012. The installed pump capacity is reported to be 1,200 gpm. The most recent flow test (2007) reported a pumping rate of 1,075 gpm at 217 ft TDH, with a static water level of 30.1 ft. The low-carbon well screens have exceeded the typical 40 year service life of this type of screen.

Ranney Collector Well 5 Ranney Collector Well 5 was constructed in 1957. The well has 13 horizontal lateral screens in three tiers. This well is the largest producer of the well field, contributing 36% of the total raw water for the Wheeler plant in 2012. The installed pump capacity is reported to be 1,200 gpm. The most recent flow test (2006) reported a pumping rate of 917 gpm at 143 ft TDH, with a static water level of 25.1 ft. The low-carbon well screens have exceeded the typical 40 year service life of this type of screen.

Elder Well 1 Elder Well 1 was constructed in 2007 as a cable-tool well. The well has a 24-inch casing and screen. This well produced 6% of the total raw water for the Wheeler plant in 2012. The original specific capacity of the well was 20.2 gpm/ft of drawdown. The most recent test (2012) of the well indicated that the specific capacity of the well is 19.2 gpm/ft. The reported pump capacity of the well is 1,000 gpm, however the recent test indicated a flow rate of 578 gpm at normal operating pressure.

Elder Well 2 Elder Well 2 was constructed in 2009 as a cable-tool well. The well has a 24-inch casing and screen. This well produced 16% of the total raw water for the Wheeler plant in 2012. The original specific capacity of the well was 63.2 gpm/ft of drawdown. The most recent test (2012) of the well indicated that the specific capacity of the well is 50.4 gpm/ft. The reported pump capacity of the well is 700 gpm.

Norton Well 1 Norton Well 1 was constructed in 1910 as a rock well. Records for this well were not available. Norton Wells 1 & 2 together contributed 11% of the total raw water for the Wheeler plant in 2012.

Norton Well 2 Norton Well 2 was constructed in 1910 as a rock well. Records for this well were not available. Norton Wells 1 & 2 together contributed 11% of the total raw water for the Wheeler plant in 2012.

4.1.2 Lafayette

The Lafayette Well Field consists of nine vertical sand and gravel wells. The original wells were constructed between 1967 and 1969.

EXHIBIT REC-1

Hall Well The Hall Well was constructed in 1967 as a gravel-packed well with a 42-inch casing and 30-inch screen. The well was later lined with an 18-inch casing and screen. The original specific capacity of the well was 50.2 gpm/ft of drawdown. The most recent test (2012) of the well indicated that the specific capacity of the well has declined to 5.8 gpm/ft. The reported pump capacity of the well is 800 gpm, however the recent test indicated a flow rate of 433 gpm at normal operating pressure. This well has been appropriately recommended for replacement.

Welborn Well The Welborn Well was originally constructed in 1968 as a gravel-packed well. The well was replaced in 1987 with a cable-tool well, and again in 2002 with a gravel-packed well with a 16-inch casing and screen. The original specific capacity of the well constructed in 2002 was 50.6 gpm/ft of drawdown. The most recent test (2013) of the well indicated that the specific capacity of the well has declined to 33.1 gpm/ft. The reported pump capacity of the well is 1,400 gpm, however the recent test indicated a flow rate of 633 gpm at normal operating pressure. It is likely that this pump is operating far from it's best efficiency point. This well is in need of aggressive rehabilitation. Inspection is recommended to diagnose the causes of loss of efficiency, followed by physical and chemical treatment tailored to the specific well problems.

Srackengast Well The Srackengast Well was constructed in 1968 as a gravel-packed well with a 42-inch casing and 30-inch screen. The well was later lined with an 24-inch casing and screen. The original specific capacity of the well was 35.4 gpm/ft of drawdown. The most recent test (2013) of the well indicated that the specific capacity of the well has declined to 9.1 gpm/ft. The reported pump capacity of the well is 1,400 gpm, however the recent test indicated a flow rate of 421 gpm at normal operating pressure. It is likely that this pump is operating far from it's best efficiency point. This well has been appropriately recommended for replacement.

Tucker Well The Tucker Well was constructed in 1968 as a gravel-packed well with a 42-inch casing and 30-inch screen. The well was later lined with an 24-inch casing and screen. The original specific capacity of the well was 55.3 gpm/ft of drawdown. The most recent test (2013) of the well indicated that the specific capacity of the well has declined to 12.3 gpm/ft. The reported pump capacity of the well is 1,400 gpm, however the recent test indicated a flow rate of 421 gpm at normal operating pressure. It is likely that this pump is operating far from it's best efficiency point. This well has been appropriately recommended for replacement.

Tuxford Well The Tucker Well was constructed in 1969 as a gravel-packed well with a 42-inch casing and 30-inch screen. The well was later lined with an 16-inch casing and screen. The original specific capacity of the well was 33.9 gpm/ft of drawdown. The most recent test (2013) of the well indicated that the specific capacity of the well has declined to 14.1 gpm/ft. The reported pump capacity of the well is 800 gpm, however the recent test indicated a flow rate of 495 gpm at normal operating pressure. It is likely that this pump is operating far from it's best efficiency point. Eventual replacement of this well is recommended. If the well will be operated for an extended period of time before replacement, aggressive rehabilitation and evaluation of pumping equipment is recommended.

Gahimer Well The Gahimer Well was originally constructed in 1969 as a gravel-packed well. The well was replaced in 2011 with a cable-tool well with a 24-inch casing and screen. The original specific capacity of the well constructed in 2011 was 31.2 gpm/ft of drawdown. The most recent test (2013) of the well indicated that the specific capacity of the well has declined to 26.3 gpm/ft. The reported pump capacity of the well is 800 gpm. Regular inspection, followed by physical and chemical treatment tailored to the specific well problems is recommended to maintain the efficiency and preserve the useful life of this well.

Jarrett Well The Jarrett Well was constructed in 1969 as a gravel-packed well with a 42-inch casing and 30-inch screen. The original specific capacity of the well was 18.5 gpm/ft of drawdown. The well pumps fine sand, and as a result is only used when necessary. The pump capacity and condition of the well is unknown. Eventual replacement of this well is recommended.

Rock Well The Rock Well was constructed in 1969 as a gravel-packed well with a 42-inch casing and 30-inch screen. The well was later lined with an 18-inch casing and screen. The original specific capacity of the well was 80.0 gpm/ft of drawdown. The most recent test (2013) of the well indicated that the specific capacity of the well has declined to 10.0 gpm/ft. The reported pump capacity of the well is 1,000 gpm, however the recent test indicated a flow rate of 672 gpm at normal operating pressure. It is likely that this pump is operating far from it's best efficiency point. This well has been appropriately recommended for replacement.

Hanna Well The Hanna Well was constructed in 2009 as a cable-tool well with a 24-inch casing and screen. The original specific capacity of the well is unknown. The most recent test (2012) of the well indicated that the specific capacity of the well is 110.1 gpm/ft and that it had dropped 40-50% from the original specific capacity. The reported pump capacity of the well is 1,400 gpm, however the recent test indicated a flow rate of 881 gpm at normal operating pressure. It is likely that this pump is operating far from it's best efficiency point. Regular inspection, followed by physical and chemical treatment tailored to the specific well problems is recommended to maintain the efficiency and preserve the useful life of this well.

4.2 Static water levels in the Lafayette well field

Water levels in the Lafayette Well Field have reached a pseudo steady-state level since the well field was placed in service in the late 1960's. Figure 6 shows the combined annual withdrawals from the City's Lafayette well field and nearby Town of Alexandria wells over the past two and half decades. Average withdrawals over that period have been relatively stable, ranging from 4 to 5 mgd. Over the same period, static water levels appear to have also remained stable. The fact that water levels have stabilized indicates that pumping has not exceeded recharge and the current rate of withdrawal is sustainable.

4.3 Lafayette Well Field operational data

In order to obtain data for evaluation of well interference and groundwater modeling, Lafayette production wells were instrumented and observed for two weeks between July 15 and July 29, 2013. The water level data was analyzed with HEC-DSSVue. In addition, we received trend data from the SCADA system showing pumping rates for the same time period. Table 3 summarizes water levels and pumping rates for each well monitored during the first week of observations.

All wells in the Lafayette well field were instrumented with the exception of the Tucker well. After inspection of the Tucker Well with City utility operations staff, it was determined that there was insufficient room in the casing for safe installation of a transducer. Two additional transducers were installed in monitoring wells on the Fuller property and near the Welborn well. Figures 7 and 8 show water level elevations (ft amsl) observed during the first week of data collection. Observations during the second week were similar, and as a result are not shown. Figure 7 shows water levels in the southern cluster of pumping wells, including the Hall, Welborn, Srackengast, and Hanna wells. As indicated previously, the Tucker well could not be instrumented. Figure 8 shows water levels in the northern cluster of pumping wells, including the Tuxford, Gahimer, and Rock wells.

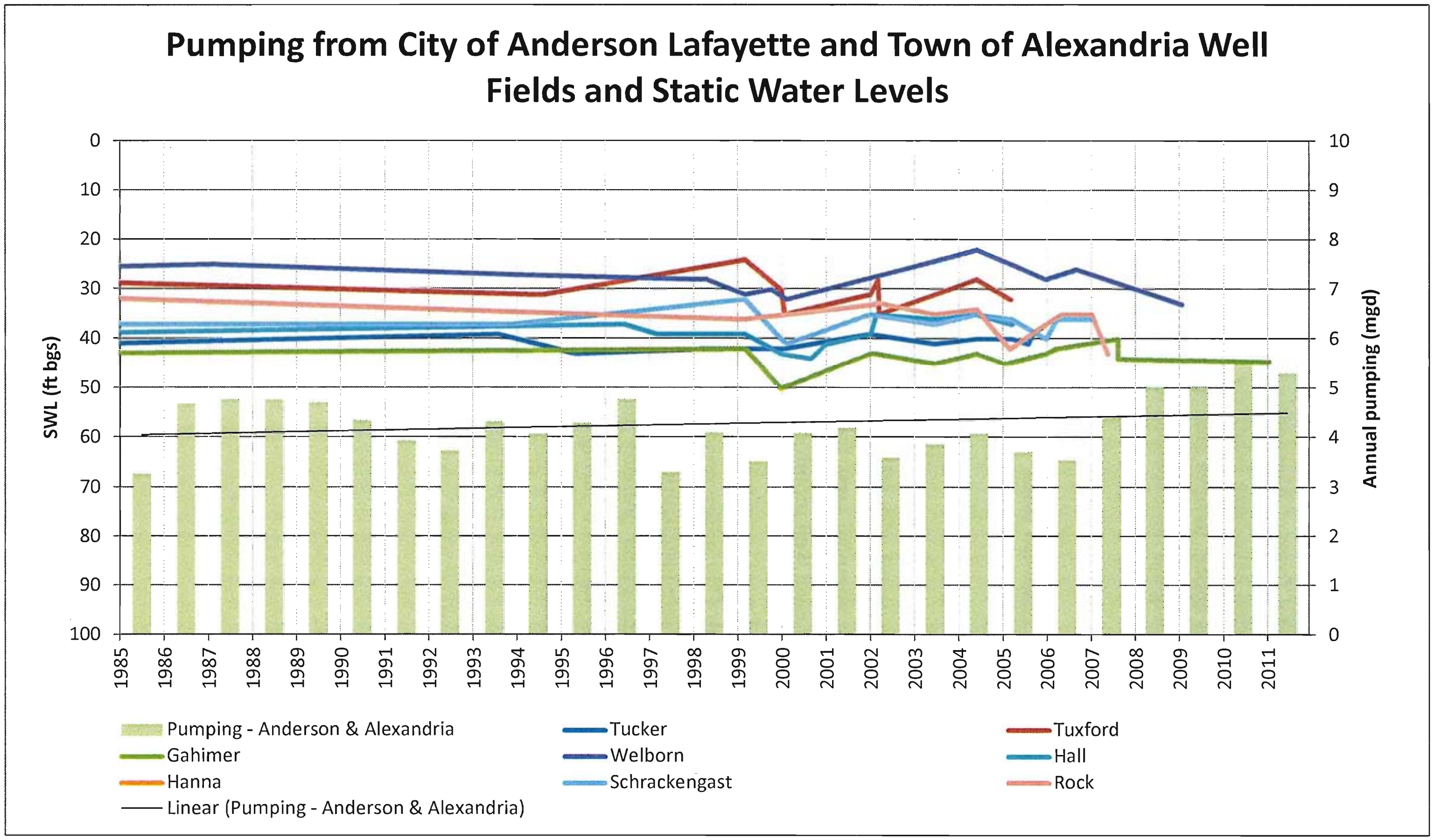

Figure 6: Historical pumping from the City's Lafayette well field and Town of Alexandria wells and water levels in the Lafayette well field.

EXHIBIT REC-1

EXHIBIT REC-1

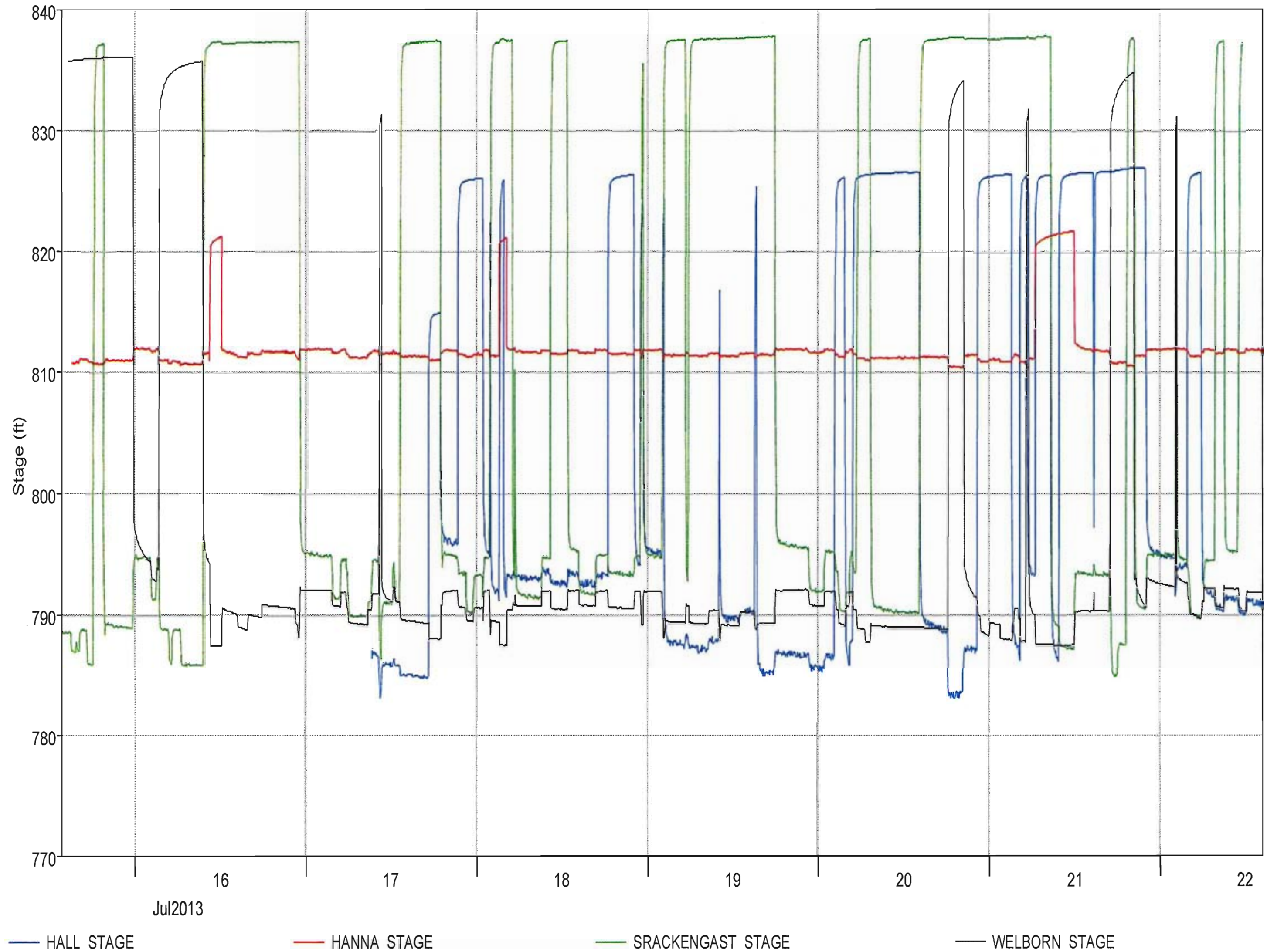

Figure 7: Elevation of pumping and non-pumping water levels for the southern cluster of wells in the Lafayette Well Field.

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EXHIBIT REC-1

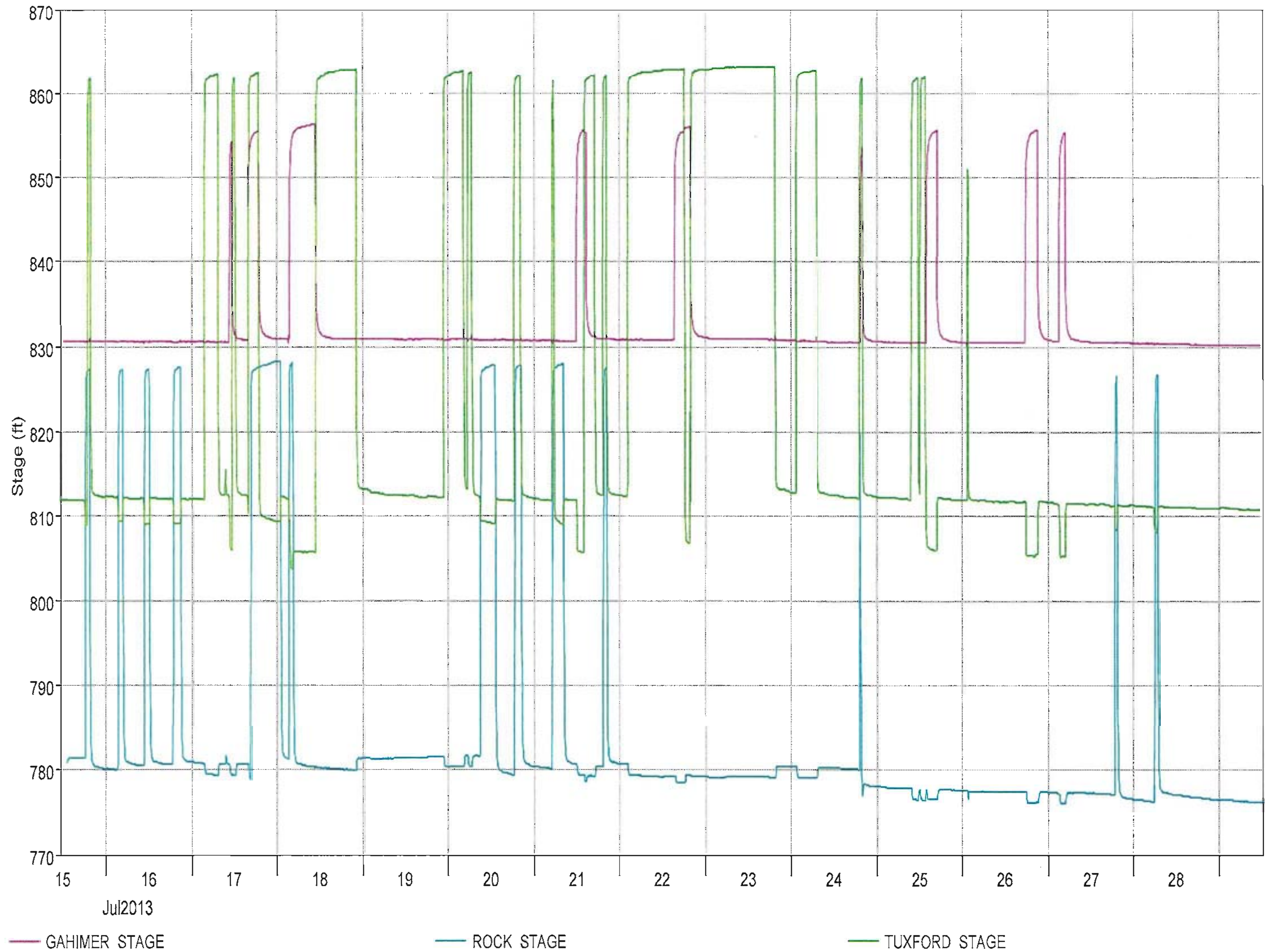

Figure 8: Elevation of pumping and non-pumping water levels for the northern cluster of wells in the Lafayette Well Field.

EXHIBIT REC-1

Table 3: Range of pumping rates (gallons per minute) of monitored wells during the first week of observations (July 15 through July 22).

Well	Non-Pumping Max. Water Level (ft)*	Max. Pumping Water Level (ft)*	Pumping Rate Range (gpm)	Average Pumping Rate (gpm)
Hall	35.8	88.2	230 - 334	255
Welborn	26.6	75.4	716 - 798	746
Srackengast	35.7	88.6	510 - 634	600
Tucker	Monitoring not possible			
Tuxford	29.1	88.3	562 - 660	580
Gahimer	44.0	70.8	599 - 602	600
Jarrett	33.6	0**	0	0
Rock	55.6	107.8	478 - 520	500
Hanna	44.9	57.6	887 - 998	905

** measured from the top of casing, coinciding with elevation of well on Table 2*

*** Jarrett Well not pumped during study, passive water level changes; gpm = gallons per minute.*

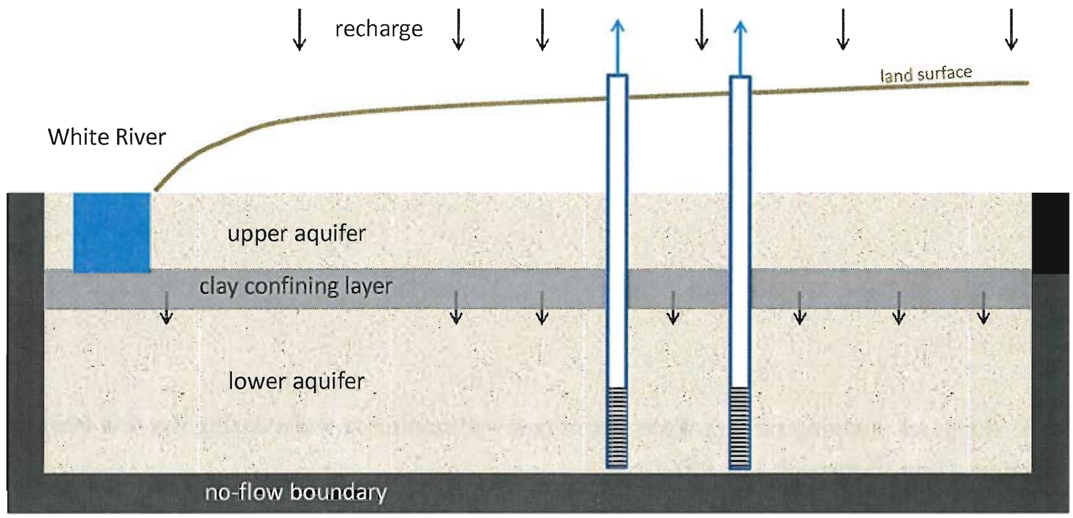

Figure 9: The conceptual groundwater model of the Lafayette Well Field consists of a two-aquifer system.

5 Groundwater Model

The objective of our model was to simulate the effects of adding new wells to the existing Lafayette well field. We used an analytical element model TimML to simulate aquifer conditions based on well logs and observed field data. The model was calibrated to historical pumping and water level data before using it to simulate the effects of additional pumping.

5.1 Conceptual model

A MODFLOW groundwater model was created in May 2011 for the Wellhead Protection Area delineation [3]. This model used a conceptual model with four layers, including two confining units, one above and one below an unconsolidated aquifer and a lower bedrock aquifer layer. We chose a different conceptual model to better represent the interaction of the shallow and deeper unconsolidated aquifers. Based on geologic well log information we decided that a three layer, two aquifer system was appropriate. Because we focused only on the Lafayette Well Field, there was no need to add a bedrock aquifer layer. Figure 9 shows the two-aquifer groundwater flow system conceptual model. Near the White River, the aquifers receive some recharge from the river, but the majority of recharge to the aquifer results from infiltration of precipitation from the ground to the upper aquifer and from there through a leaky confining unit to the lower aquifer.

Near a well, the water-level decline in each aquifer is approximately proportional to the pumping rate of the well. The proportionality constants are determined by the transmissivities of the two aquifers, and the vertical conductance of the confining layer. Here we discuss the parameterization of a regional two-aquifer model. In the lower aquifer, the steady drawdown at a distance r from the well is given by

$$s(r) = \frac{Q_w}{2\pi} K_0 \left(\frac{r}{\lambda}\right) \tag{1}$$

where s [ft] is the drawdown at the distance r, Qw [ft^3/d] is the pumping rate of the well, K_0 is the modified Bessel function of the second kind with order zero, and λ [ft] is the representative leakage distance. The leakage distance λ is given as

$$\lambda = \sqrt{T \times c} \tag{2}$$

where T [ft^2/d] is the aquifer transmissivity (the product of the saturated thickness and hydraulic conductivity) and c [d] is the resistance of the confining layer,

$$c = \frac{d}{K_v} \tag{3}$$

where d [ft] is the thickness of the confining layer and K_v[ft/d] is the vertical hydraulic conductivity of the confining layer.

While it is possible to determine the resistance c of the clay confining layer by making assumptions about it's geometry and conductivity, we relied on observed well interference to conservatively estimate the resistance. The value of the function K_0 is nearly zero at a distance $r = 4\lambda$. This means that at a distance $r = 4\lambda$ away from a pumping well, the cone of depression caused by the well pumping is insignificant or near zero. This distance r is referred to as the *radius of influence* of the well. In the Lafayette well field, we observed that pumping of the Gahimer Well has no significant influence on water levels at the Jarrett Well, located approximately 4,000 ft to the west (Figure 10). This suggests that the radius of influence of the well is equal to or less than 4,000 ft. The Hall and Hanna Wells are closer in distance (3,100 ft.) and similarly did not show any interference. However, review of geologic logs indicates that these two wells may be completed in different aquifer layers, which would also minimize interference. Estimating the radius of influence based on the Gahimer and Jarrett wells is more conservative. Figure 11 illustrates the concept of recharge from the upper to lower aquifer within the radius of influence of the well.

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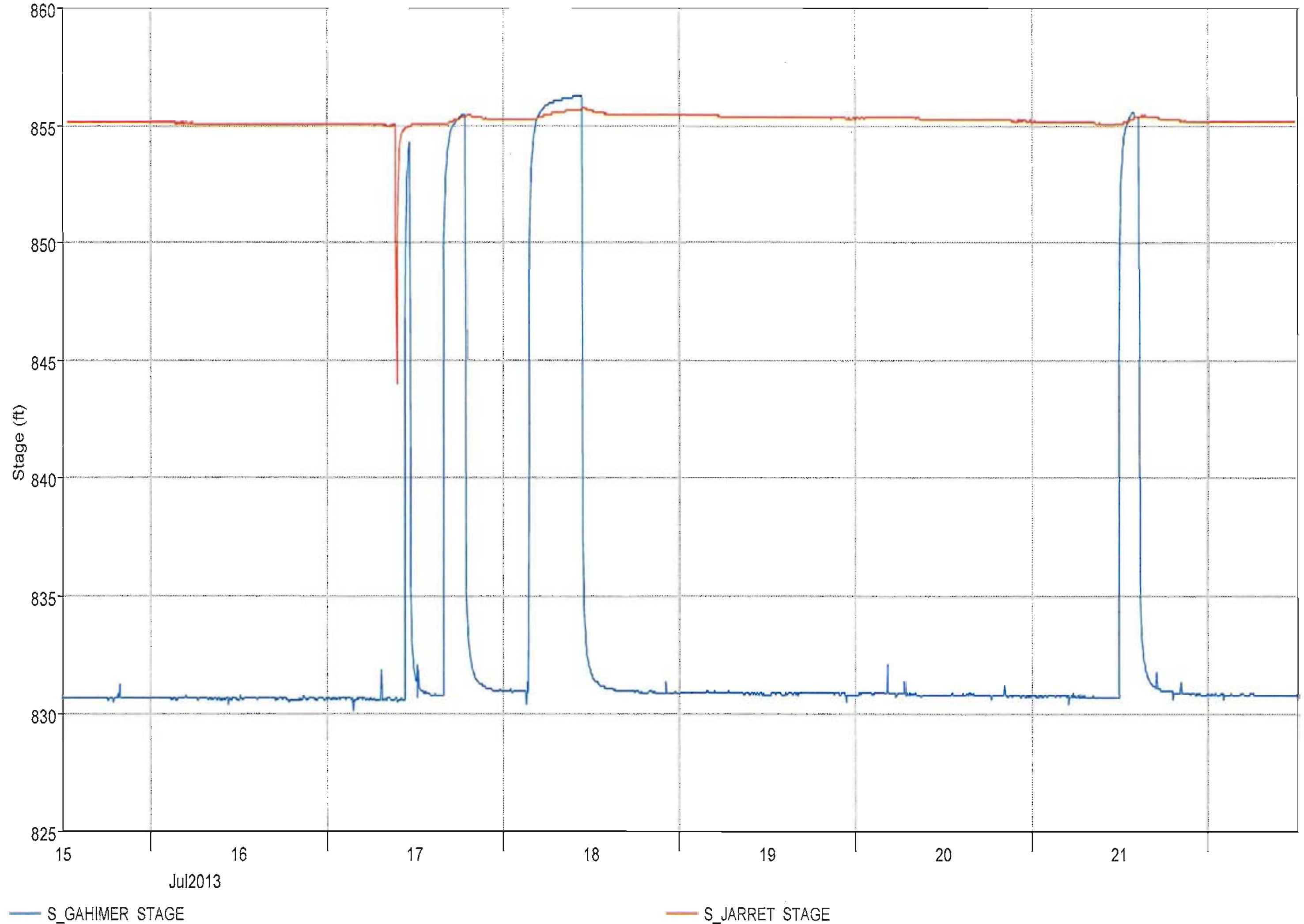

Figure 10: The fact that the Gahimer Well pumping has no significant influence on the Jarrett Well helped define the area of influence between wells.

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EXHIBIT REC-1

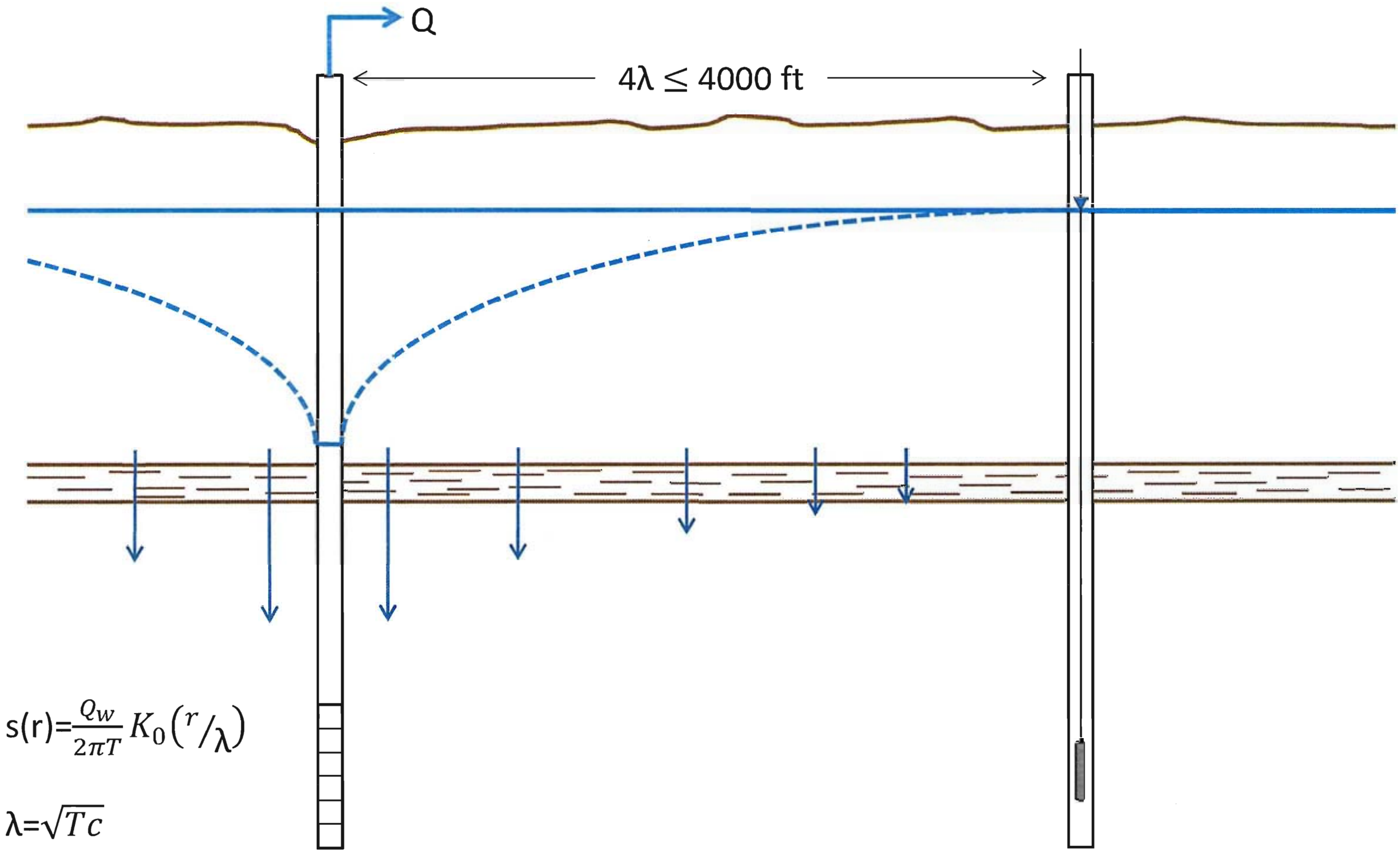

Figure 11: The recharge to the aquifer occurs within the area of influence of the production well.

EXHIBIT REC-1

Table 4: Estimated transmissivity values.

Well	SC (gpm/ft)	T (ft^2/d)	K (ft/d)
Hall	50	13,434	192
Welborn	30	7,990	174
Srackengast	35	9,472	201
Tucker	55	14,797	187
Tuxford	34	9,055	168
Gahimer	31	8,354	135
Jarrett	26	6,932	82
Rock	37	9,872	123
Hanna	112	29,968	357
Average		12,208	180

SC = specific capacity; T = transmissivity;
K = hydraulic conductivity;
gpm/ft = gallons per minute per foot of drawdown;
ft^2/d = square feet per day; ft/d = feet per day.

5.2 Model settings

The average transmissivity (T) of the aquifer is about 12,208 ft^2/day (Table 4). Transmissivity at each well was estimated from the specific capacity (SC) determined during pump testing at the time of construction

$$T = 267.38 \times SC \tag{4}$$

where T [ft^2/day] and SC [gpm/ft] is the specific capacity or the well [4]. The hydraulic conductivity K [ft/d] is the transmissivity divided by the thickness of the aquifer.

Table 5 shows the properties assigned to each of the three layers in the model. With an average T of 12,208 ft^2/day and λ of 4,000 ft, $K_v$of the confining layer is calculated to be 0.01 ft/day. The vertical component K_v of the hydraulic conductivity K of an aquifer can be assumed to be 10 percent of K. Accordingly, we used a hydraulic conductivity of 0.1 ft/day for the confining unit.

Aquifer recharge is unknown. The general rule of thumb for aquifer recharge (infiltration) is about 10 percent of precipitation. According to the Indiana State Climate Office, the average precipitation at the Anderson Sewage Plant gauge is 38.2 inches per year (from 1974 through 2003) [5]. We were able to calibrate our model with a recharge of 3.7 inches per year, which is very similar to

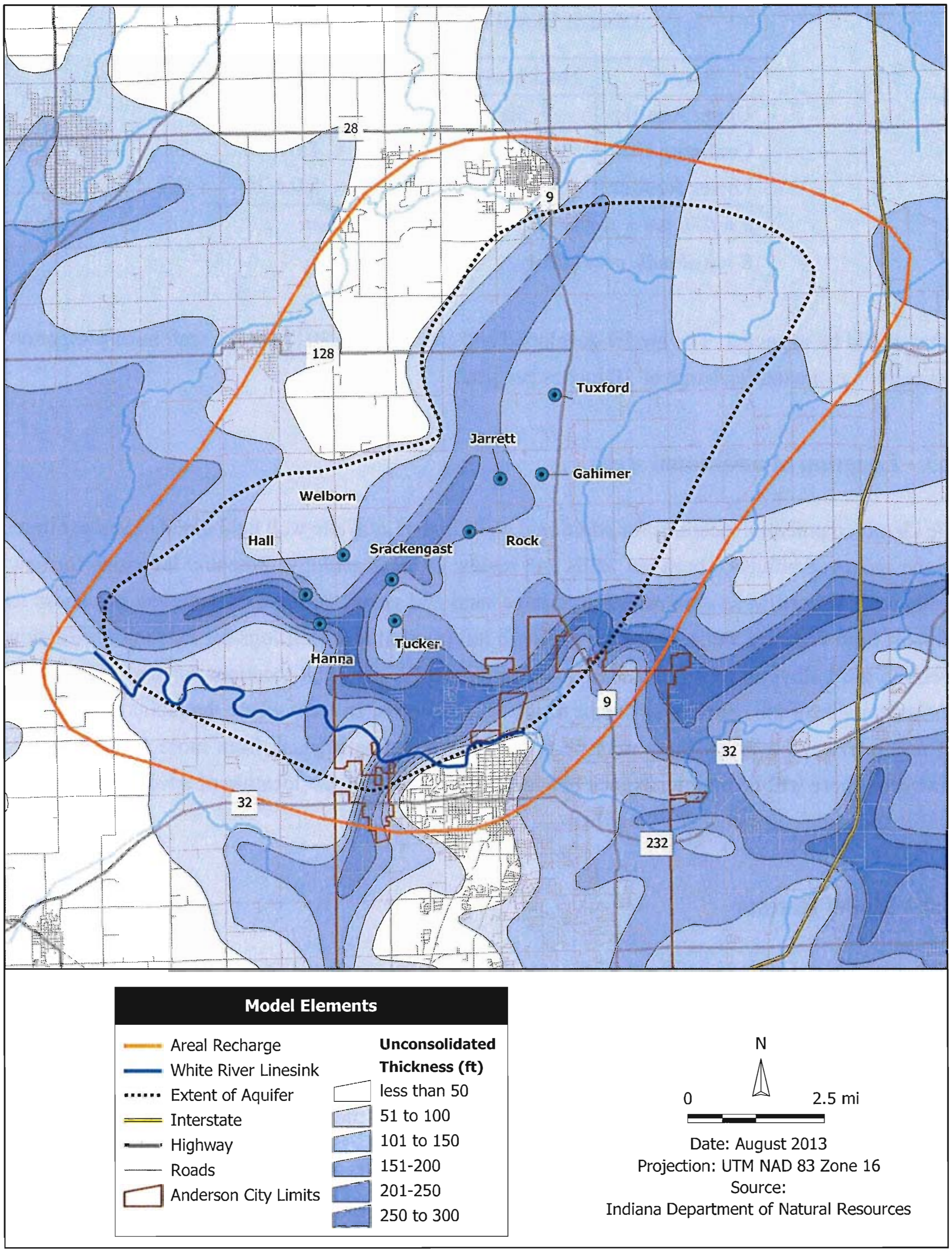

Figure 12: Elements of the groundwater model.

Table 5: Model layer properties.

Layer	Thickness (ft)	K (ft/d)	S (unitless)
Upper Aquifer	30	300	3.0×10^{-2}
Confining Unit	15	0.1	1.0×10^{-7}
Lower Aquifer	80	180	5.0×10^{-3}

ft = feet; ft/d = feet per day; S = storage coefficient;
K = hydraulic conductivity.

what would be expected. The model developed and calibrated in 2011 for the well head protection delineation estimated recharge of 10 inches per year.

5.3 Location of additional wells

We identified potential locations for additional wells in the Lafayette well field based on our estimate of the radius of influence between wells and review of local geology. Potential locations for new wells were limited to an area assumed to have sand and gravel aquifers of sufficient thickness to support high capacity wells, based on geologic information and well logs for existing production wells in the Lafayette well field. As shown in Figure 13, potential locations for new wells were chosen outside of the radius of influence of the existing wells. In areas where the radius of influence of multiple wells overlap, there may be cumulative pumping impacts from more than one well. However, there will be no interference between wells as long as the location of a well does not fall within the radius of influence of another.

5.4 Model Results

Figure 14 shows the elevation of static water levels with current pumping, as simulated by the calibrated model. It can be observed that water levels drop from the northeast to the southwest, indicating that the general direction of groundwater flow is southwest toward the White River. The elevation of water levels in the lower aquifer follow, but are slightly lower than those in the higher aquifer. This is due to the leaky clay confining layer between the two aquifers.

Figure 15 shows the simulated elevation of static water levels in the Lafayette well field with an additional average 5 mgd of pumping from the potential new wells shown in Figure 13. Figure 16 shows the estimated reduction of water levels in the Lafayette well field resulting from additional average 5 mgd of pumping from the new wells. The simulated reduction in water levels ranges from 5 ft near the White River to more than 20 ft in the northeast area of the well field.

EXHIBIT REC-1

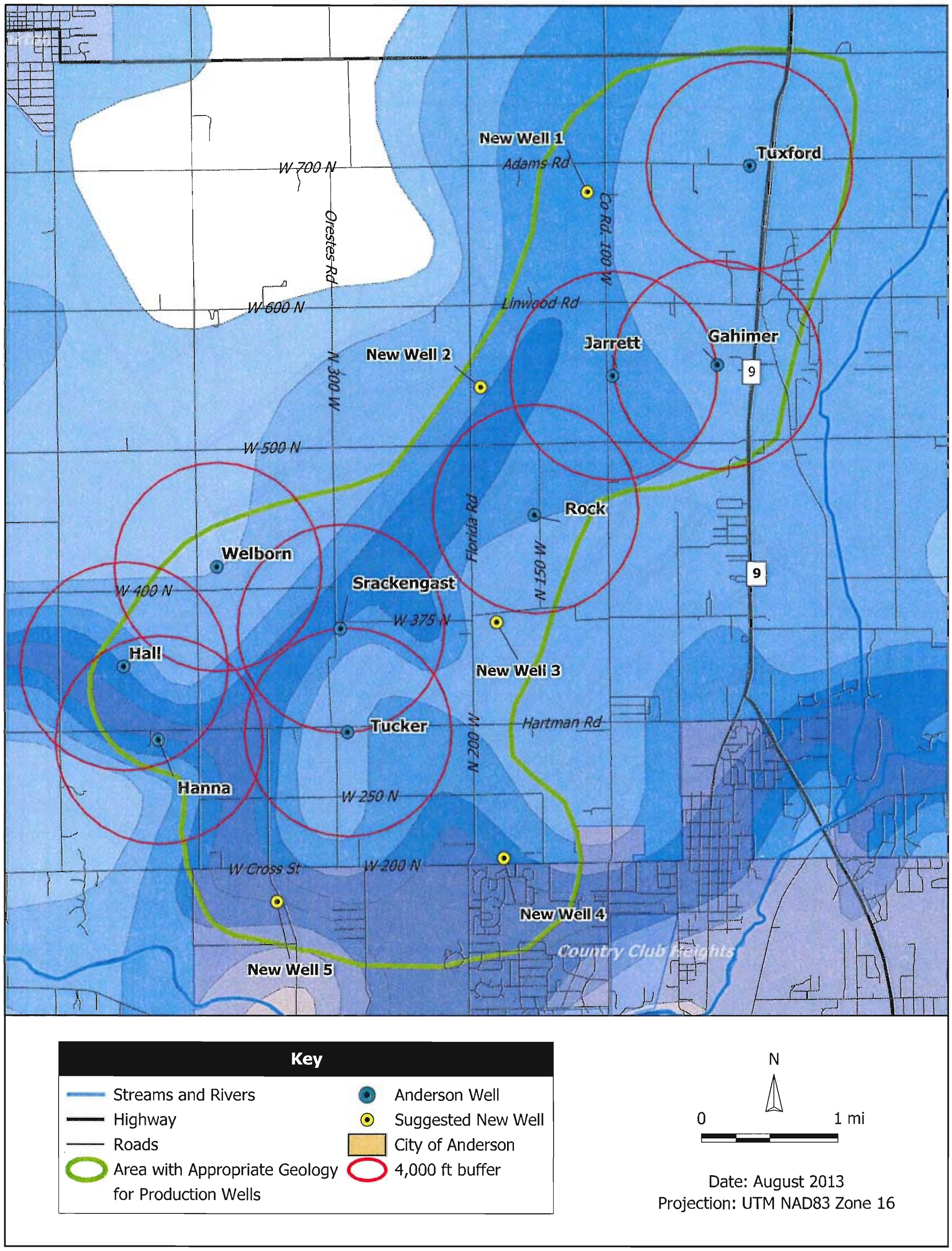

Figure 13: Potential locations for five additional wells in the Lafayette well field.

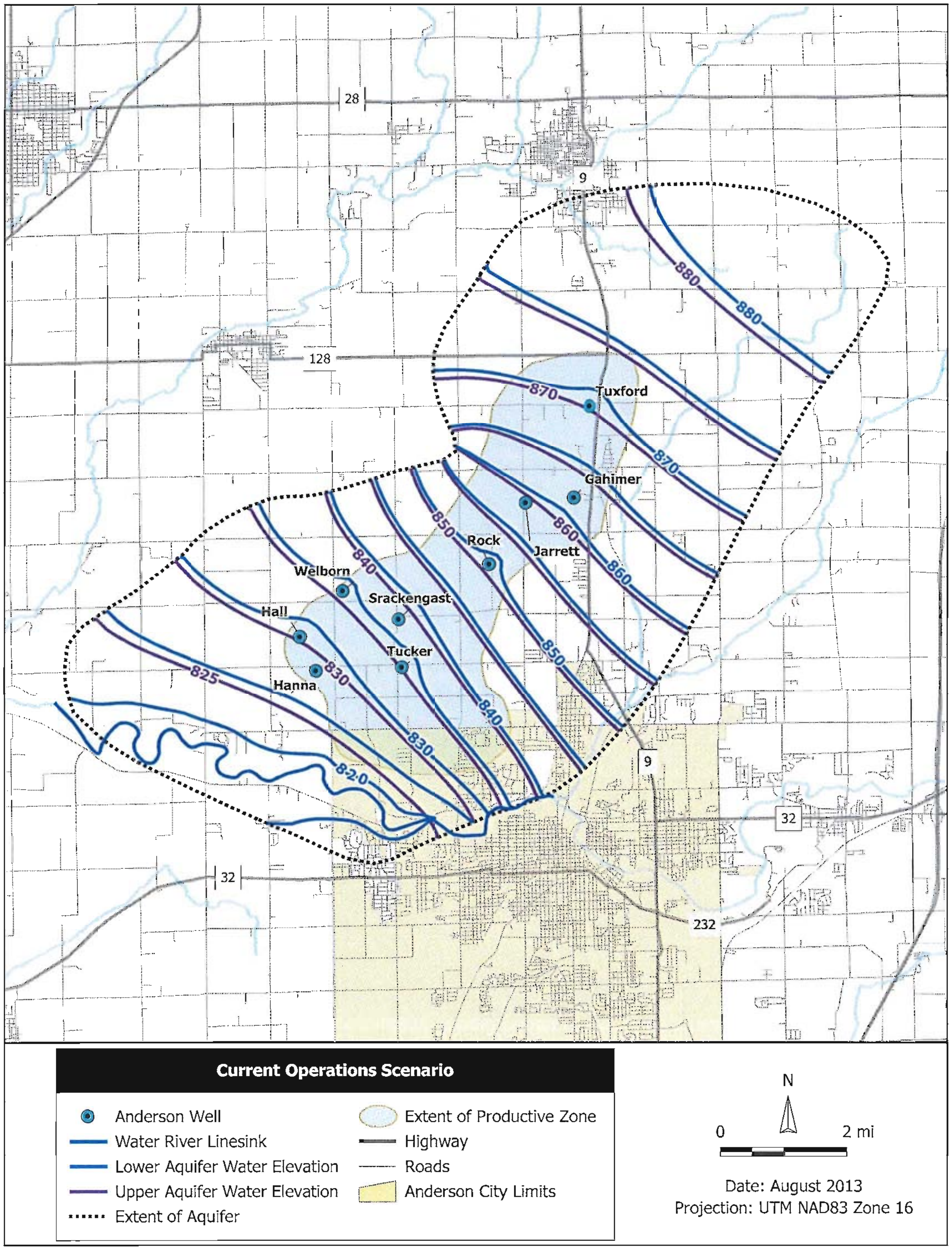

Figure 14: Elevation of current static water levels.

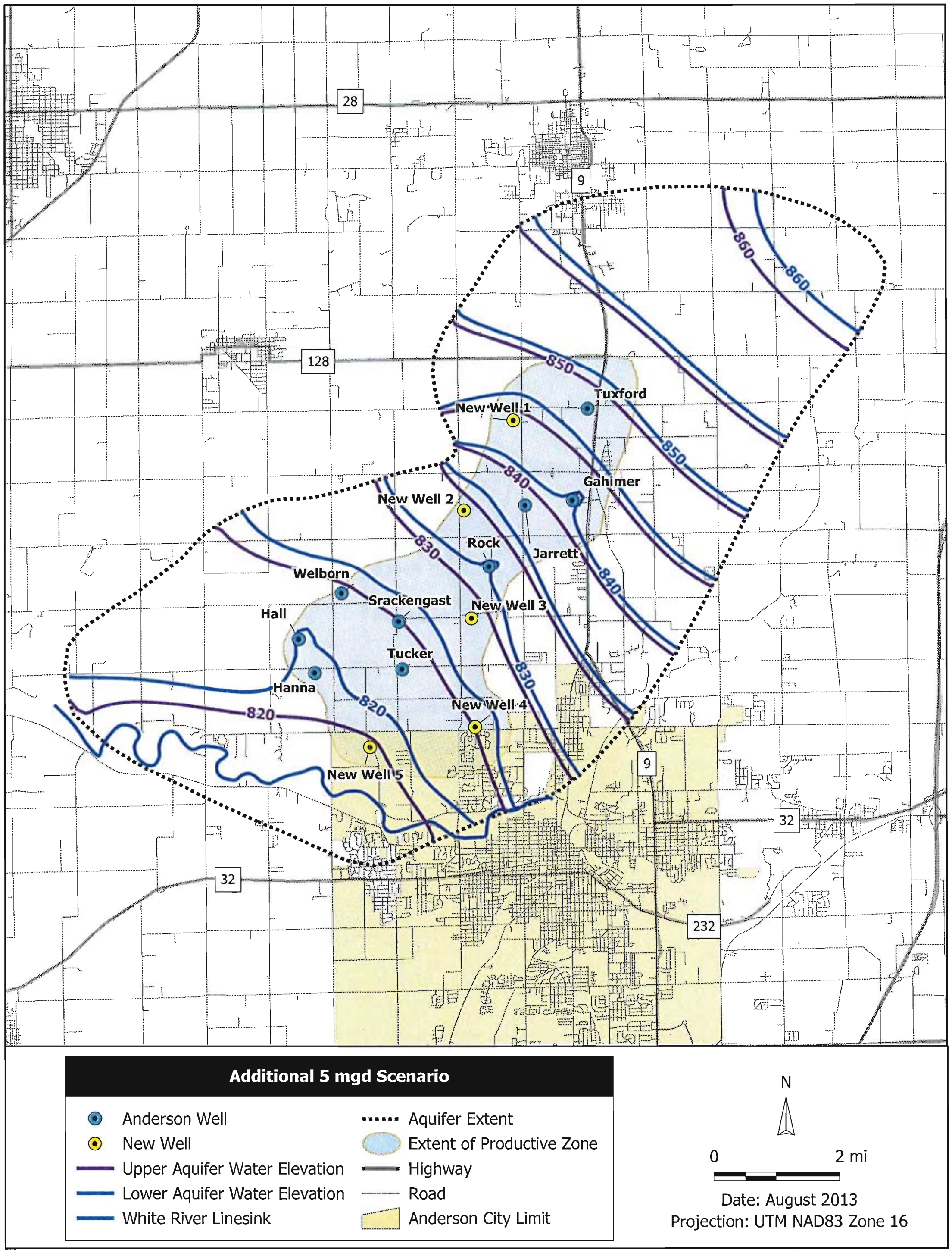

Figure 15: Simulated static water elevations resulting from additional 5 mgd average pumping.

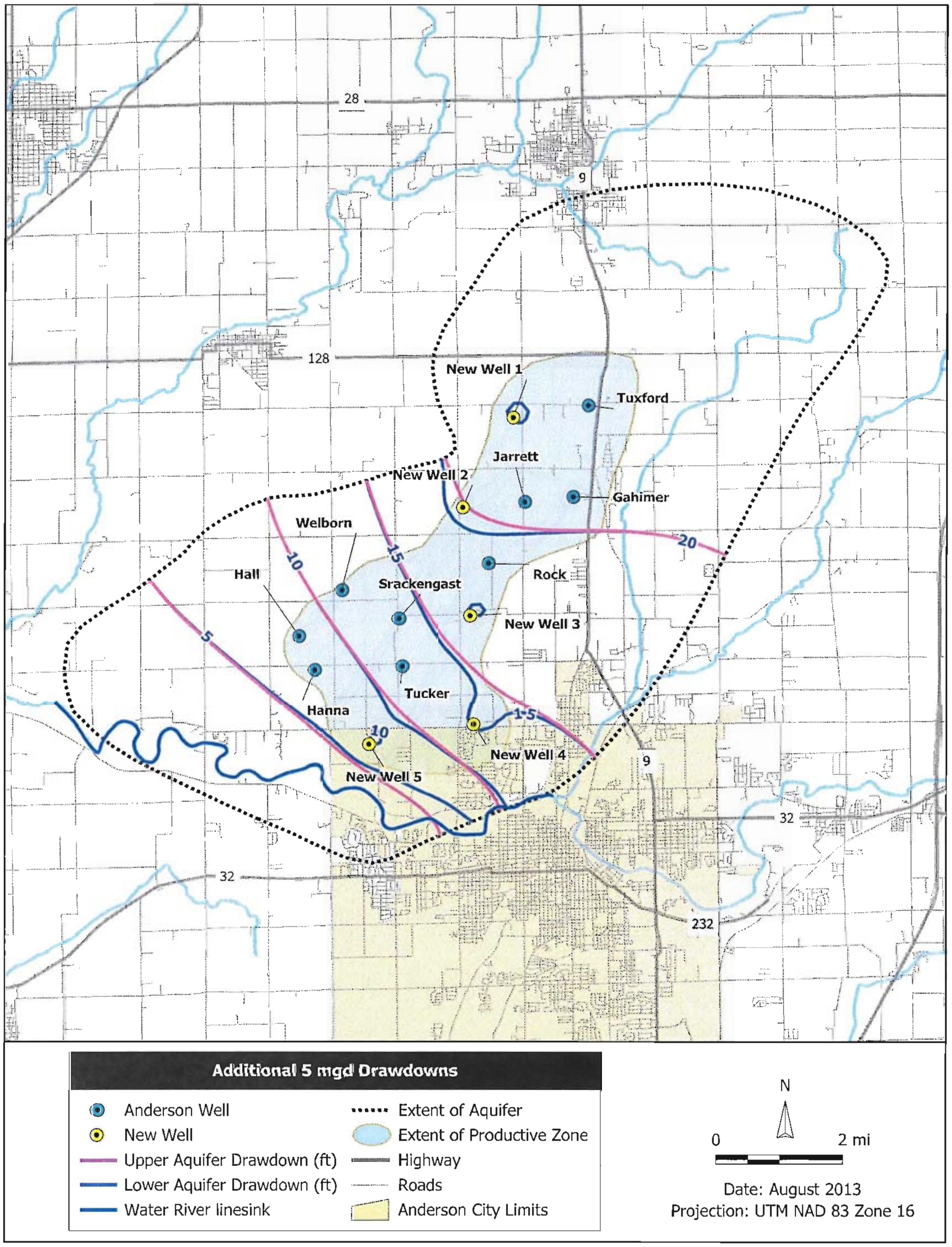

Figure 16: Simulated reduction in static water levels resulting from additional 5 mgd average pumping.

6 Conclusions and Recommendations

6.1 Replacement of existing wells in the Lafayette well field

In early August, the City requested that we review and comment on the proposed well replacements included in the Phase I Capital Improvement Plan. The plan recommends the replacement of the Rock, Srackengast, Hall and Tucker wells. Based on our review of existing information and the results of our analysis, we strongly agree with the replacement of those wells. These wells have experienced significant loss of efficiency over the last 40 years. In addition to the wells currently proposed for replacement, we recommend that the Tuxford and the Jarrett wells also be considered for replacement. If available property permits, we recommend that replacement wells be located a minimum of 100 ft away from the wells to be replaced, pending confirmation by test borings of suitable aquifer materials.

6.2 Rehabilitation and maintenance of Wheeler well field

The yield of the Wheeler well field needs to be maintained while the treatment facility remains in service. Decisions to invest in the addition and maintenance of capacity at the Wheeler well field will necessarily be weighed with consideration of the expected remaining life of the treatment facilities. Options for maintaining capacity of the Wheeler well field include the following.

- Clean and/or rehabilitate one or more of the existing collector wells.
- Perform regular inspection and maintenance of the Elder Wells. With limited available draw-down, the efficiency of these wells is critical to maintaining their yield. We recommend inspection and aggressive rehabilitation as required to prevent clogging and permanent loss of efficiency which could result from deferred maintenance.
- Investigate the potential to construct one or more additional bedrock wells near the existing transmission main.

6.3 Expansion of Lafayette well field

Our analysis indicates that the existing wells are spaced adequately such that there is negligible pumping interference between them.

6.3.1 Preliminary estimate of additional yield

Based on our analysis, at least 5 additional 1 mgd wells could be constructed in the Lafayette well field and operated without detrimental effect on the existing wells. Higher, short term pumping is feasible. Nevertheless, the additional withdrawals would lower the water table in the upper and lower aquifers. General locations for these wells are shown in Figure 13. Well spacing is based on the radius of influence estimated to be equal to or less than 4,000 ft.

6.3.2 Monitoring to evaluate impacts and improve estimates of additional yield

The sustainable yield of the aquifer will ultimately be limited by the available recharge, impacts to other users, or both. We recommend the installation of a shallow monitoring well in a location away from the White River and existing production wells. The purpose of the shallow monitoring well is to observe the response of water levels in the shallow aquifer to pumping and to obtain data important for refining the modeling of recharge of the deep aquifer and potential impacts caused by increased pumping. Instrumentation of the shallow well will provide valuable data for planning and for investigating and resolving potential claims of impacts caused by pumping of the City's wells.

At the locations of the proposed additional wells, we recommend that shallow and deep monitoring wells be installed in test borings when they are completed to characterize geology and select well sites. The monitoring well pairs will provide valuable data for optimizing the design of the new wells, assessing possible impacts to nearby homeowner wells, and for monitoring and testing the efficiency of the production wells after they have been placed in service.

6.4 Efficiency of wells

In order to optimize the yield of the existing and future infrastructure, it is recommended that wells be carefully designed and constructed to optimize efficiency. Test borings should be used to accurately characterize the aquifer materials and ensure optimal design of well screens and gravel packs. Well construction methods (cable tool or rotary with engineered gravel pack) should be selected to provide the best efficiency for the specific location and geology of each well.

Regular inspection and cleaning of existing and new wells is strongly recommended. Fouling of the natural formation and gravel pack near the well screen begins immediately and without cleaning accelerates with time. If not addressed in a timely manner, initially soft material moves deeper into the formation and hardens, becoming very difficult to remove and resulting in permanent loss of efficiency of the well.

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[3] In Aqua Veritas, Inc., 2011, Wellhead Protection Area Delineation Model.

[4] Driscoll, F. G., 1986. Groundwater and Wells (2nd ed.), Johnson Filtration Systems, Inc., St. Paul, Minnesota, 1089p.

[5] Indiana State Climate Office website. Available at: http://iclimate.org/fall/atlas/annual_precip.asp

Appendix A - Memorandum

WATER · MINERAL · ENERGY

LAYNE HYDRO

A DIVISION OF LAYNE CHRISTENSEN

MEMORANDUM

TO: Thomas Brewer, Superintendent, City of Anderson Water Department

FROM: Daniel Haddock, P. E. and Samanta Lax, P. G., Layne Hydro

DATE: June 3, 2013

SUBJECT: **Areas of potential water supply investigation**

Introduction

This memo identifies areas of potential interest for increasing the City's supply of groundwater. The memo was requested by the City of Anderson (City) for use by the City's consultants R.E. Curry and Associates (Curry) and American Structurepoint (Structurepoint) in their evaluation of conceptual alternatives for rehabilitation and expansion of supply and treatment infrastructure. The objective is to provide preliminary indication of the areas where new wells may be developed, so that Curry and Structurepoint may consider the proximity of potential supplies to existing and proposed treatment facilities. Information presented in this memo is preliminary and will be further refined in the course of our pending study *Evaluation of Groundwater Availability Near Existing Well Fields*.

Three general areas are identified and are referred to as *White River*, *Lafayette Well Field*, and *Wheeler Well Field* in this memo. Figure 1 shows the general thickness of unconsolidated material, existing wells and treatment facilities in the City's Lafayette and Wheeler well fields, wells owned by the Towns of Alexandria and Chesterfield, and outlines of the three general areas of interest. The thickness of unconsolidated material is from GIS data obtained from the IndianaMap. Unconsolidated material includes both aquifer (sand and gravel) and non-aquifer (clay) material. Each general area of interest is described below.

1 - White River This area, comprised of three separate areas along the White River, was described in our memo report *Preliminary Source of Supply Investigation for Anderson, Indiana*, dated April 2, 2013. The objective of that investigation was to identify areas within the City and to the west with the potential for development of 6 to 8 million gallons per day (mgd) of groundwater, and to make recommendations for exploratory drilling and testing to evaluate water supply potential. Based on review of available well logs, areas were identified with specific characteristics that suggest the potential for induced recharge from the

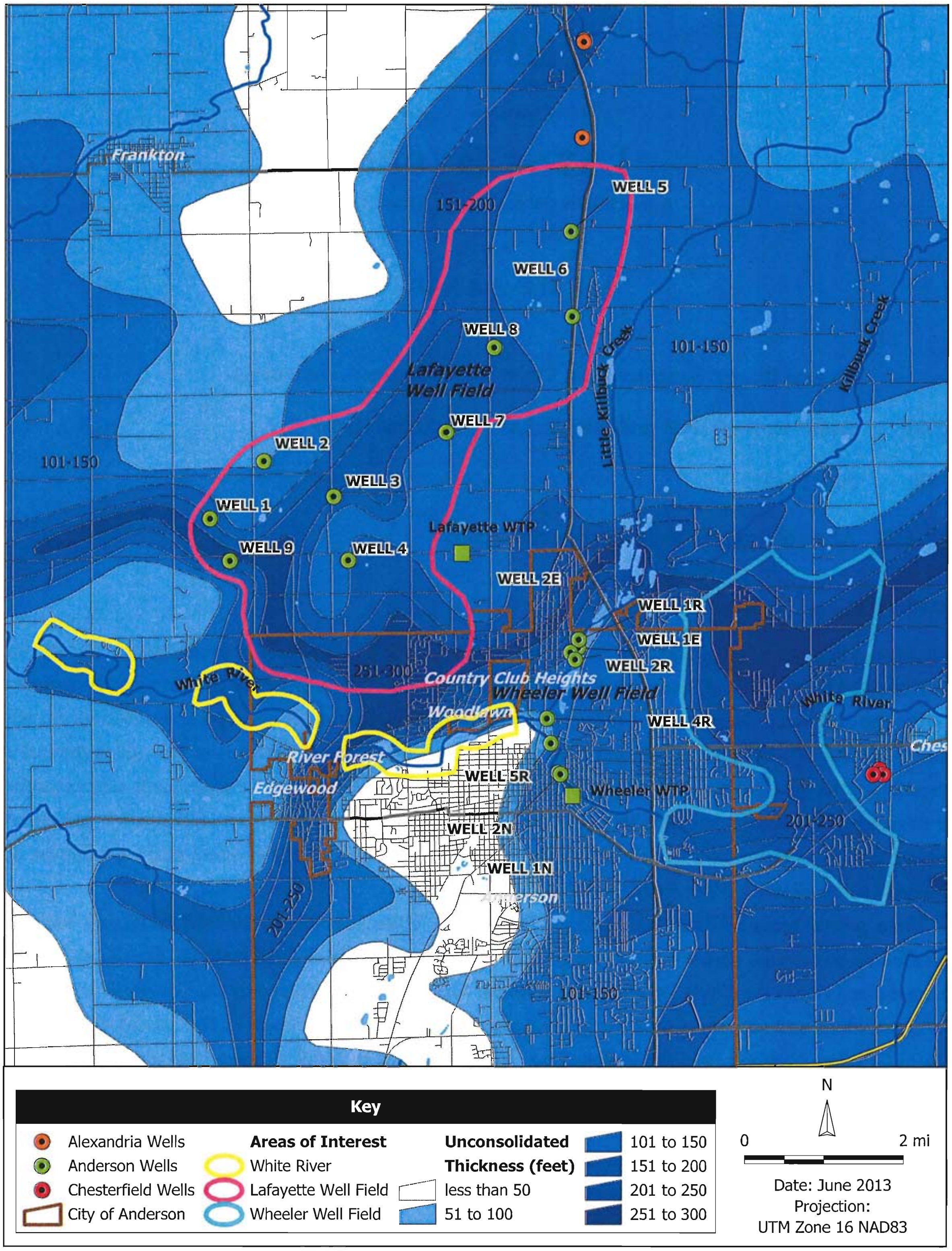


Figure 1: Areas of interest, unconsolidated thickness, and selected existing wells

White River via river bank filtration (RBF). Confirmation of feasibility will require further investigation and testing to verify the geology and evaluate the hydrological characteristics of the identified areas. It is not possible to predict potential yields of areas prior to exploratory drilling. However, existing high-capacity wells may provide a point of reference if similar settings are confirmed through drilling and testing. Indiana-American Water (INAW) operates a well field along the White River, north of Noblesville. According to data publicly available from the Indiana Department of Natural Resources (DNR) Significant Water Withdrawal Facility (SWWF) database, INAW operates six high-capacity wells, with yields ranging from 700 to 2,000 gallons per minute (gpm).

2 - Lafayette Well Field The Lafayette well field is a focus of our pending study *Evaluation of Groundwater Availability Near Existing Well Fields.* The area shown in Figure 1 is generally comprised of the existing well field and adjacent areas with greater than 150 ft of unconsolidated thickness. The area is bounded on the north by the location of existing wells owned by the Town of Alexandria (Alexandria). The potential for additional sustainable pumping from the aquifer supplying the Lafayette well field will be estimated with groundwater modeling to be completed as part of the pending study. While it is premature to quantify potential increases in yield, review of historical pumping and water levels provides a preliminary indication of feasibility. Figure 2 shows reported pumping (DNR SWWF database) from the Lafayette well field and by Alexandria, as well as reported static water levels from the City's well testing and maintenance records. From 2008 to 2011, reported average annual pumping by Alexandria ranged from 1.14 to 1.18 mgd. The reported pumping capacities of Alexandria's four wells are 800 to 1,200 gpm. During the same period, reported average annual pumping from the Lafayette well field ranged from 4.02 to 5.34 mgd. Following an initial drop in static water levels after 1969 (not shown in Figure 2) when the Lafayette well field was placed into service, static water levels appear to be generally stable. It may be possible to incrementally increase pumping from the Lafayette well field, depending on available drawdown, existing and future well construction, well interference, and available recharge. The pending study will estimate the potential additional yield, and will identify optimal locations for test drilling and future well construction.

3 - Wheeler Well Field The Wheeler well field is a focus of our pending study *Evaluation of Groundwater Availability Near Existing Well Fields.* From 2008 to 2011, reported average annual pumping from the Wheeler well field ranged from 3.88 to 4.40 mgd. The area shown in Figure 1 is generally comprised of areas east of the existing Wheeler well field and treatment facility with greater than 150 ft of unconsolidated thickness. Limited review of well logs suggests that the unconsolidated material in the area surrounding the confluence of Killbuck Creek and Little Killbuck Creek is predominantly clay, and indicates that residential wells in this area are completed in bedrock. The gravel deposits mined in the area appear to be shallow and confined to areas near the creeks. Considering the apparent limited extent of sand and gravel aquifers and limited stream flow, the area surrounding the confluence of these creeks is not included in the area of interest for the purpose of this memo.

Along the bedrock valley, further south toward the White River, some logs indicate significant thickness of sand and gravel in residential wells. The pending study will evaluate the existing Wheeler well field;

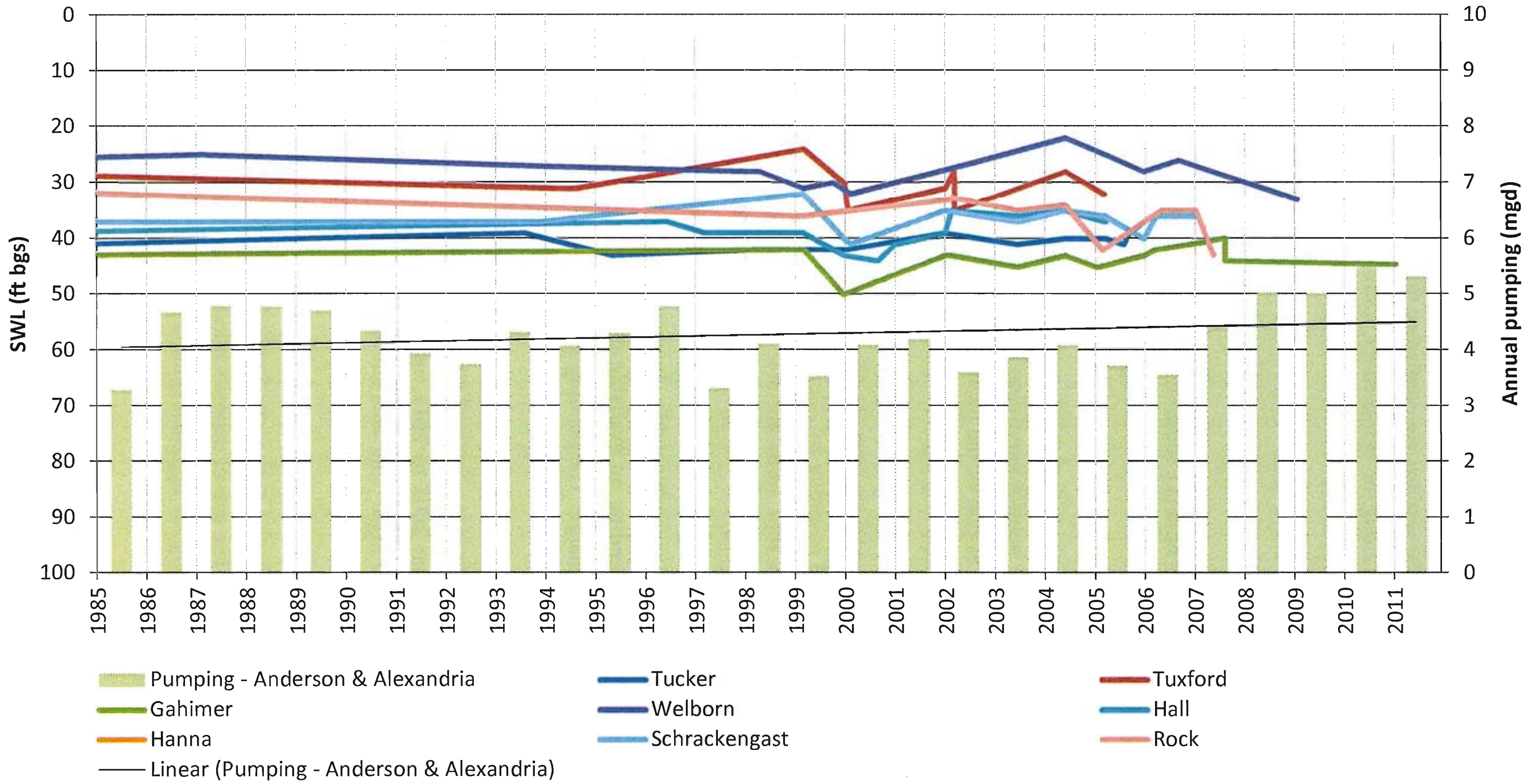


Figure 2: Historical pumping and static water levels in the Lafayette well field aquifer

EXHIBIT REC-1

EXHIBIT REC-1

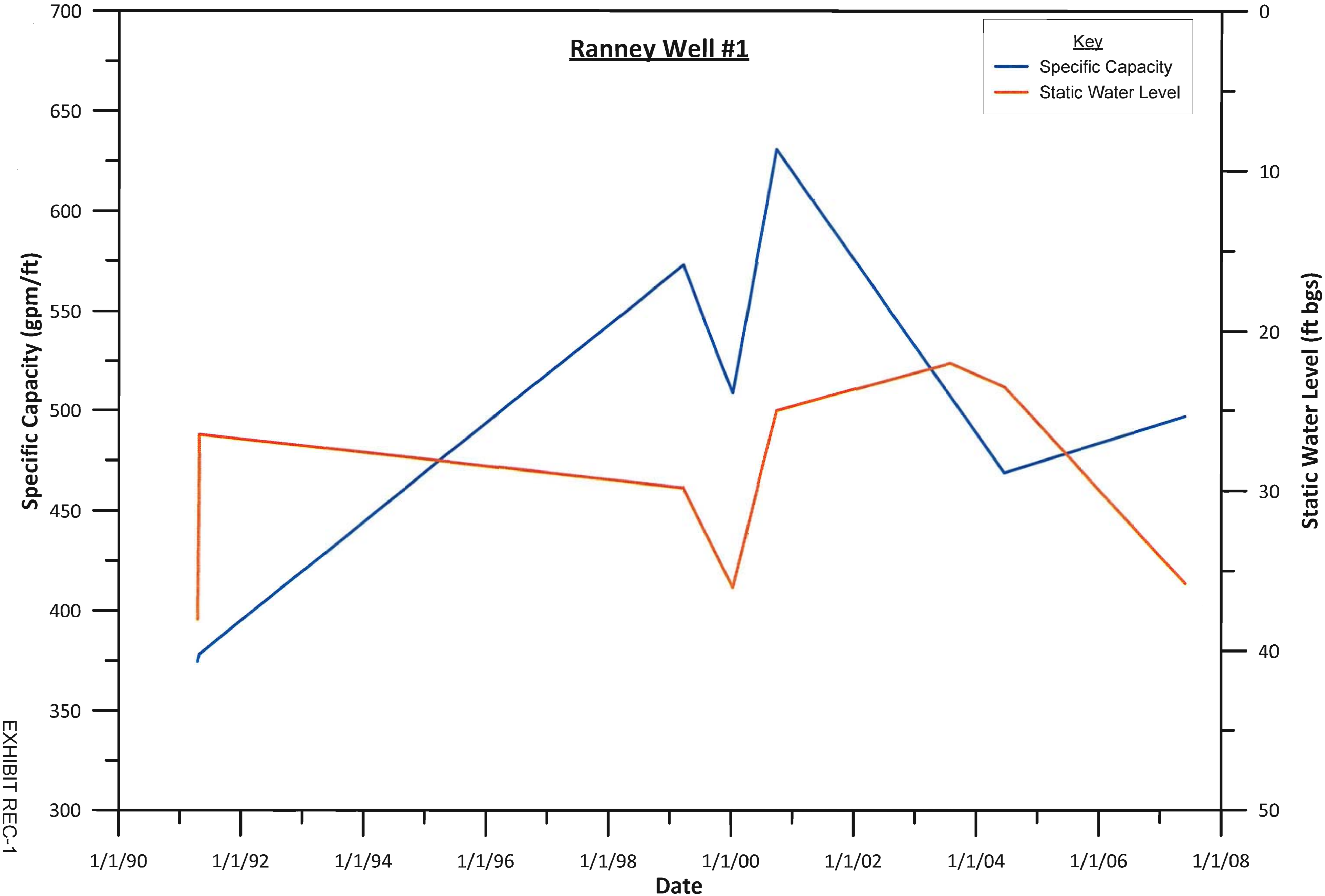
estimate the potential additional yield from areas to the east; and identify locations for test drilling. Confirmation of feasibility will require further investigation and testing to verify the geology and evaluate the hydrological characteristics of the identified areas. It is not possible to predict potential yields of areas prior to exploratory drilling. For reference, the Town of Chesterfield (Chesterfield) owns three wells, with reported pumping capacities of 363, 670, and 792 gpm. From 2008 to 2011, reported average annual pumping by Chesterfield ranged from 0.32 to 0.33 mgd. In some areas east of the Wheeler well field, the thickness of unconsolidated material appears to be comparable to that of the deeper portions of the Lafayette well field.

The information presented in this memo is preliminary, and will be further evaluated and refined as part of the pending study *Evaluation of Groundwater Availability Near Existing Well Fields.* Please feel free to contact us directly or refer others to us with questions regarding this memo or related work.

Appendix B - Historical Well Efficiency and Static Water Levels

EXHIBIT REC-1

EXHIBIT REC-1



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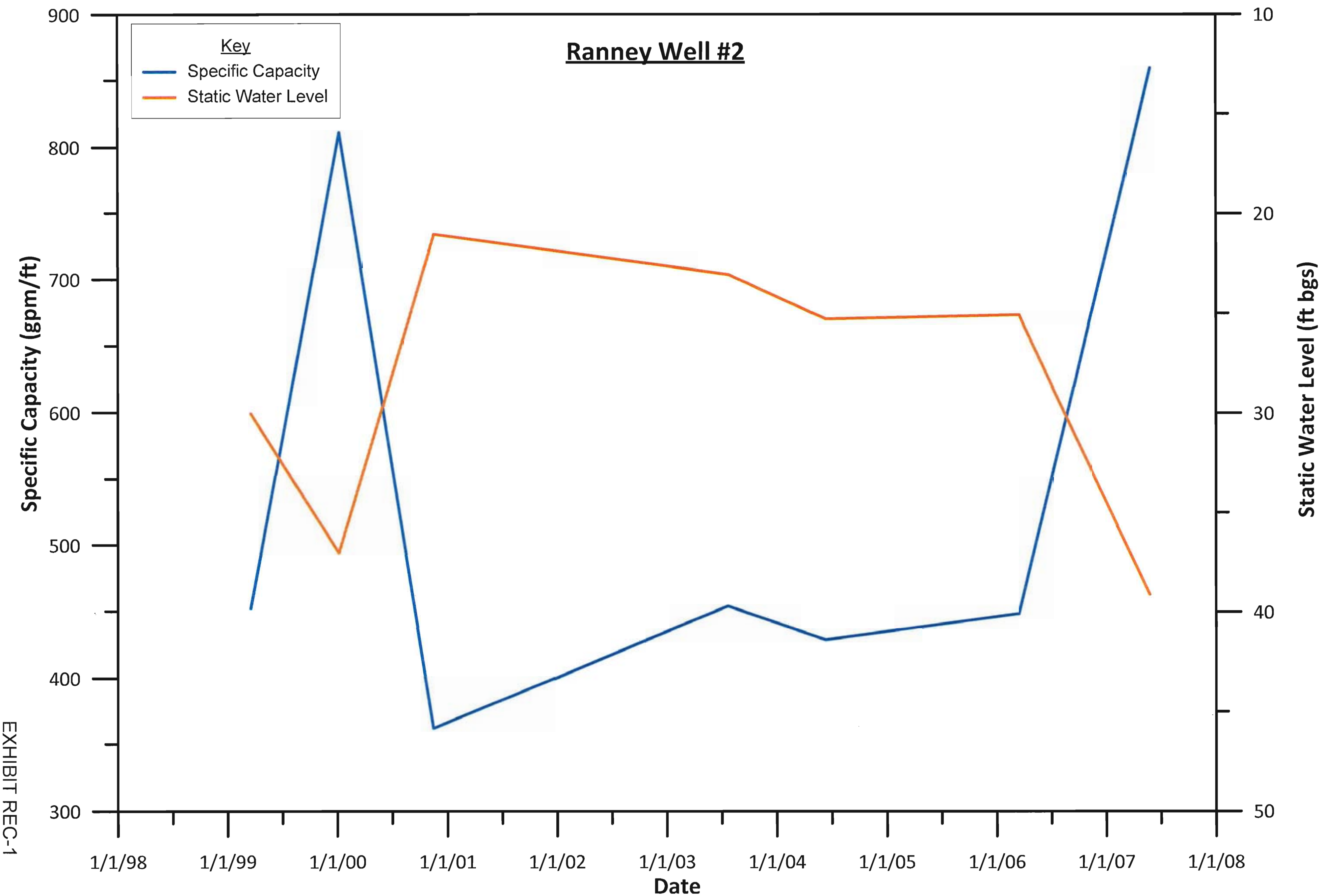

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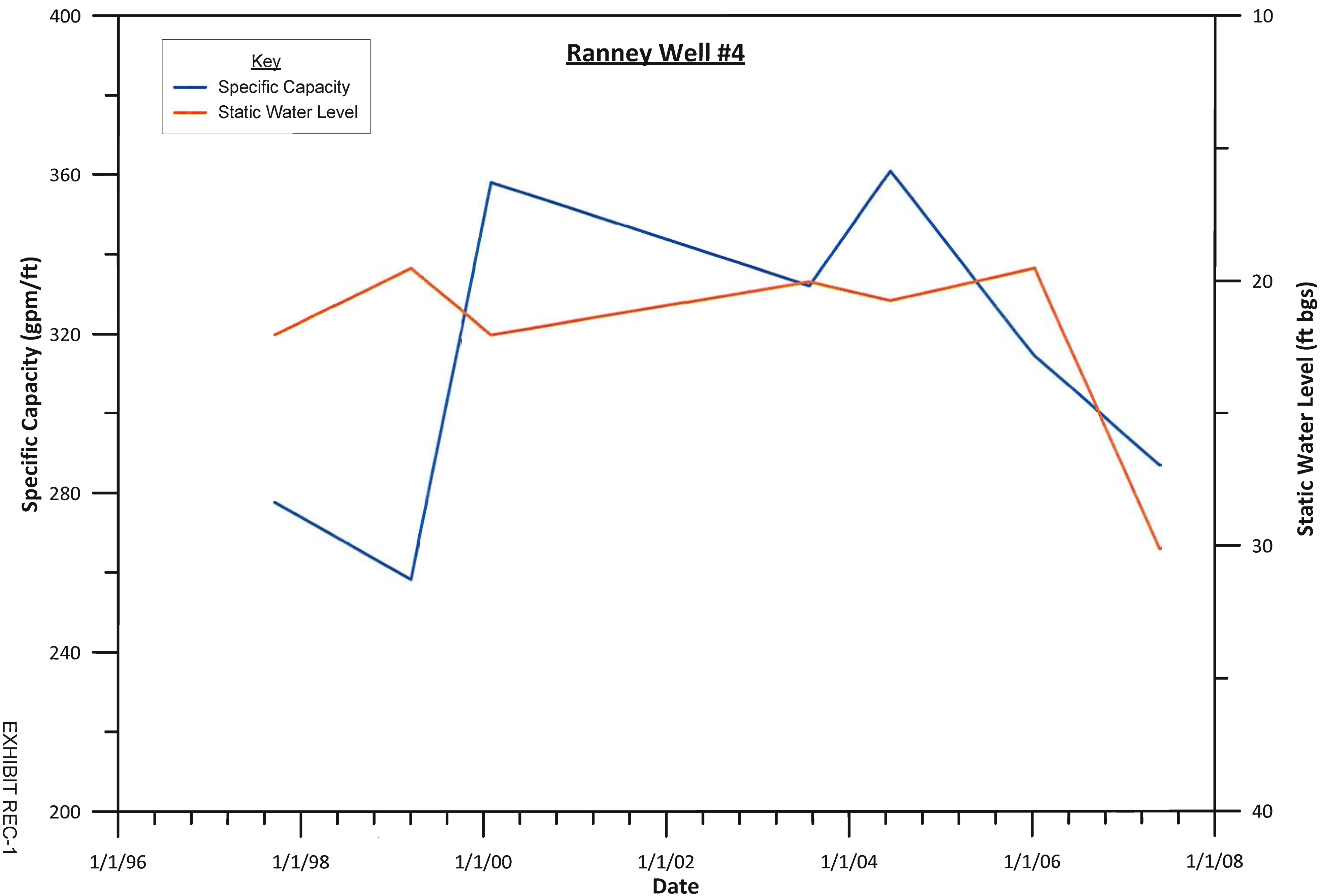

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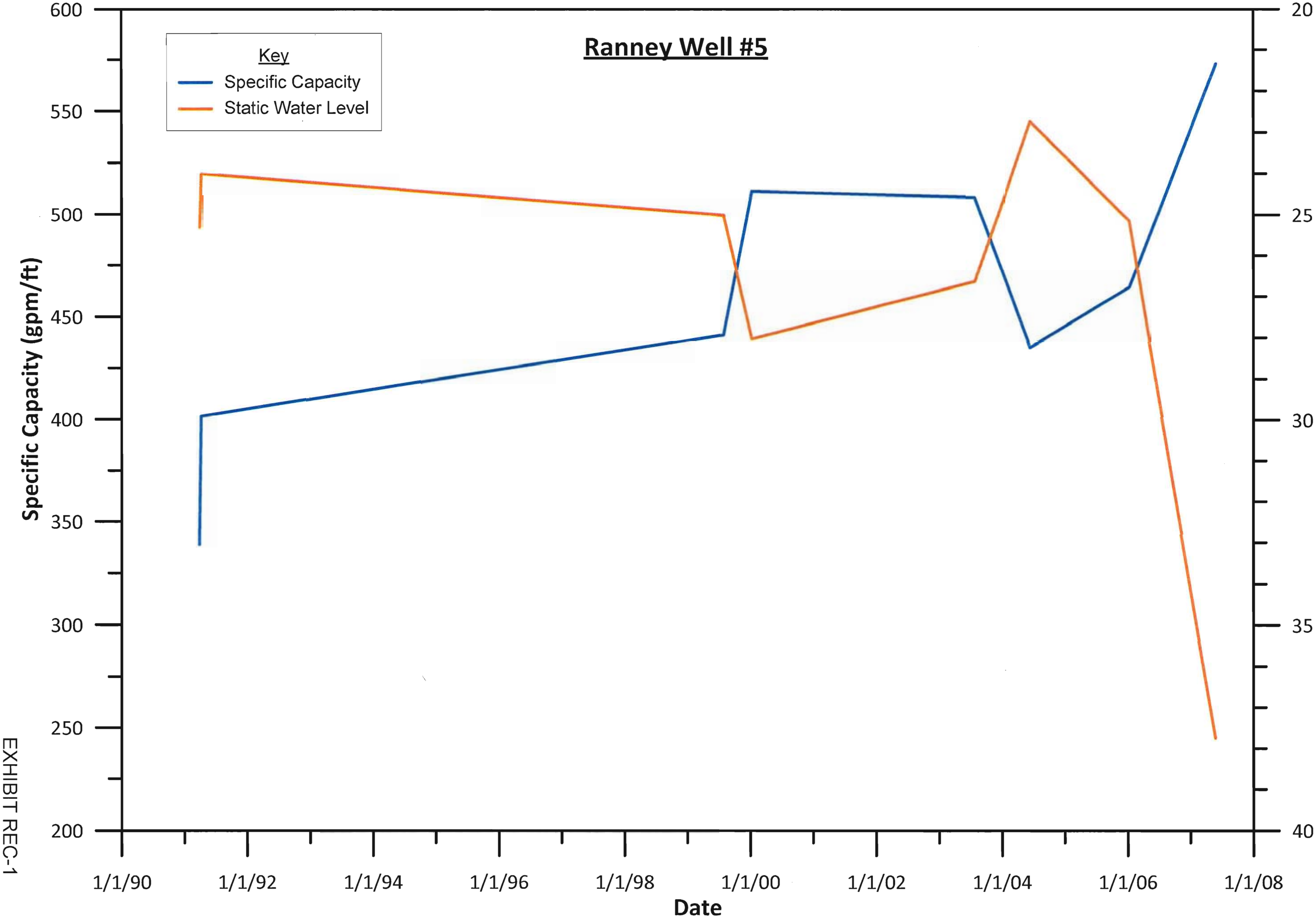

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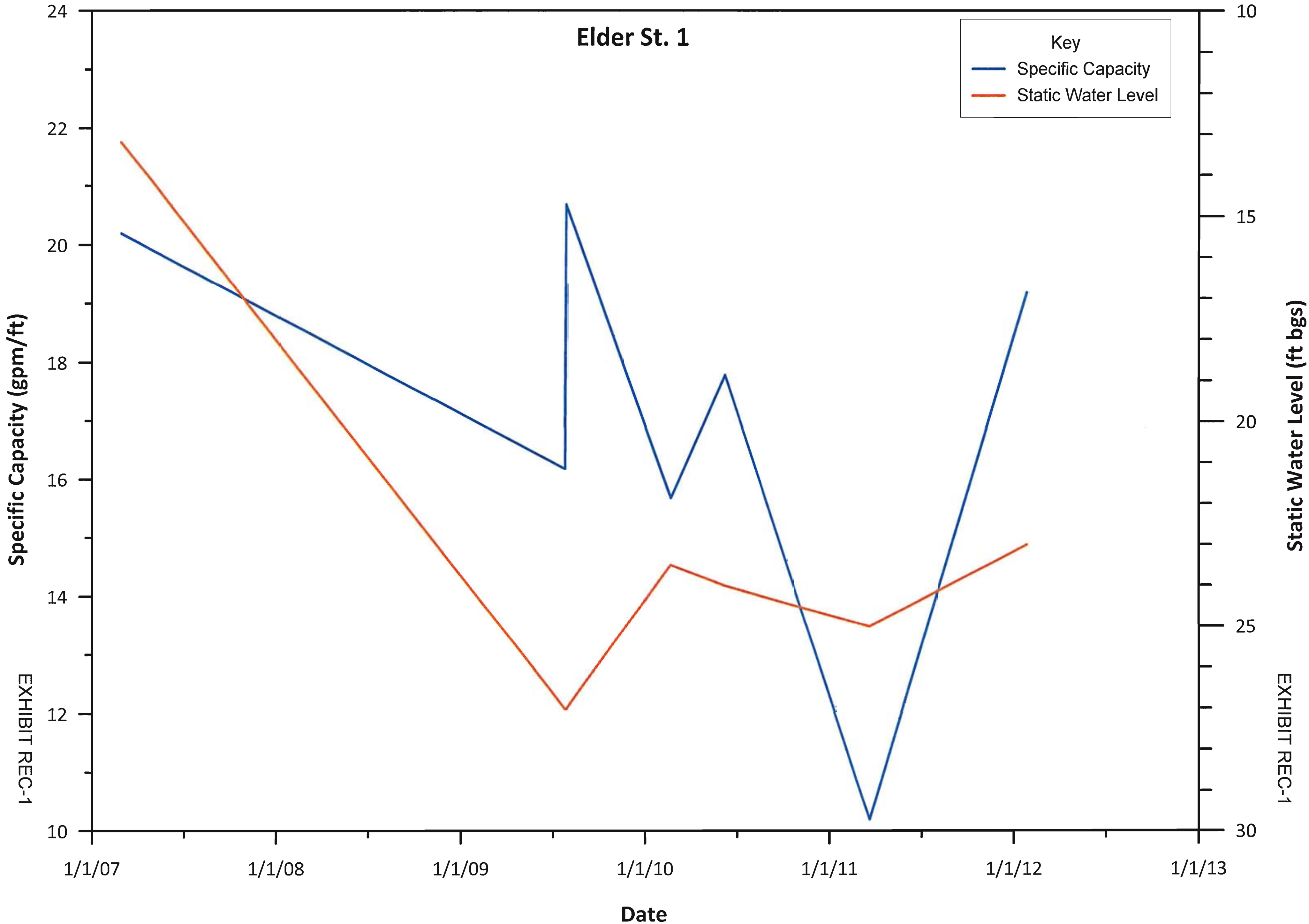

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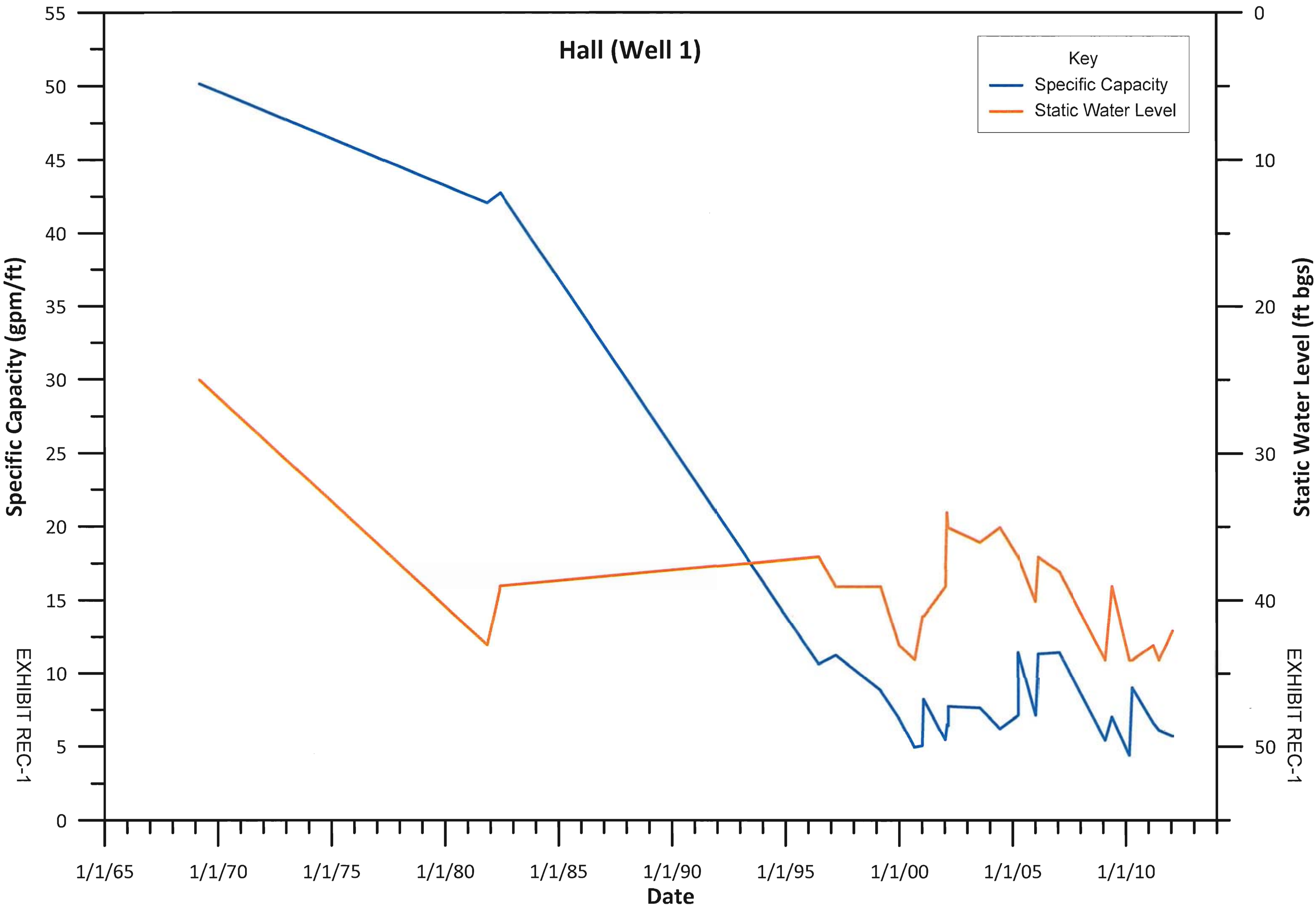

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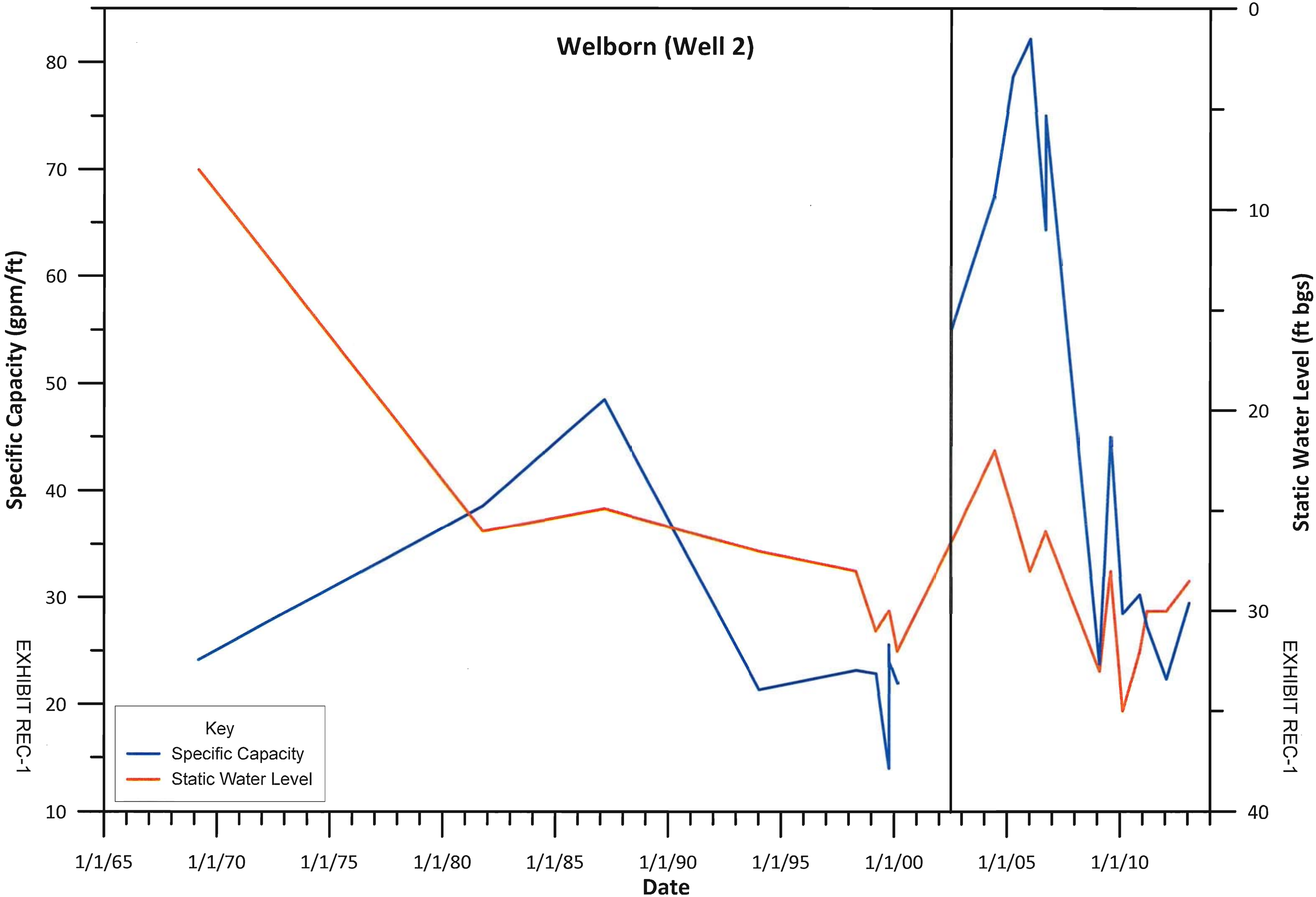
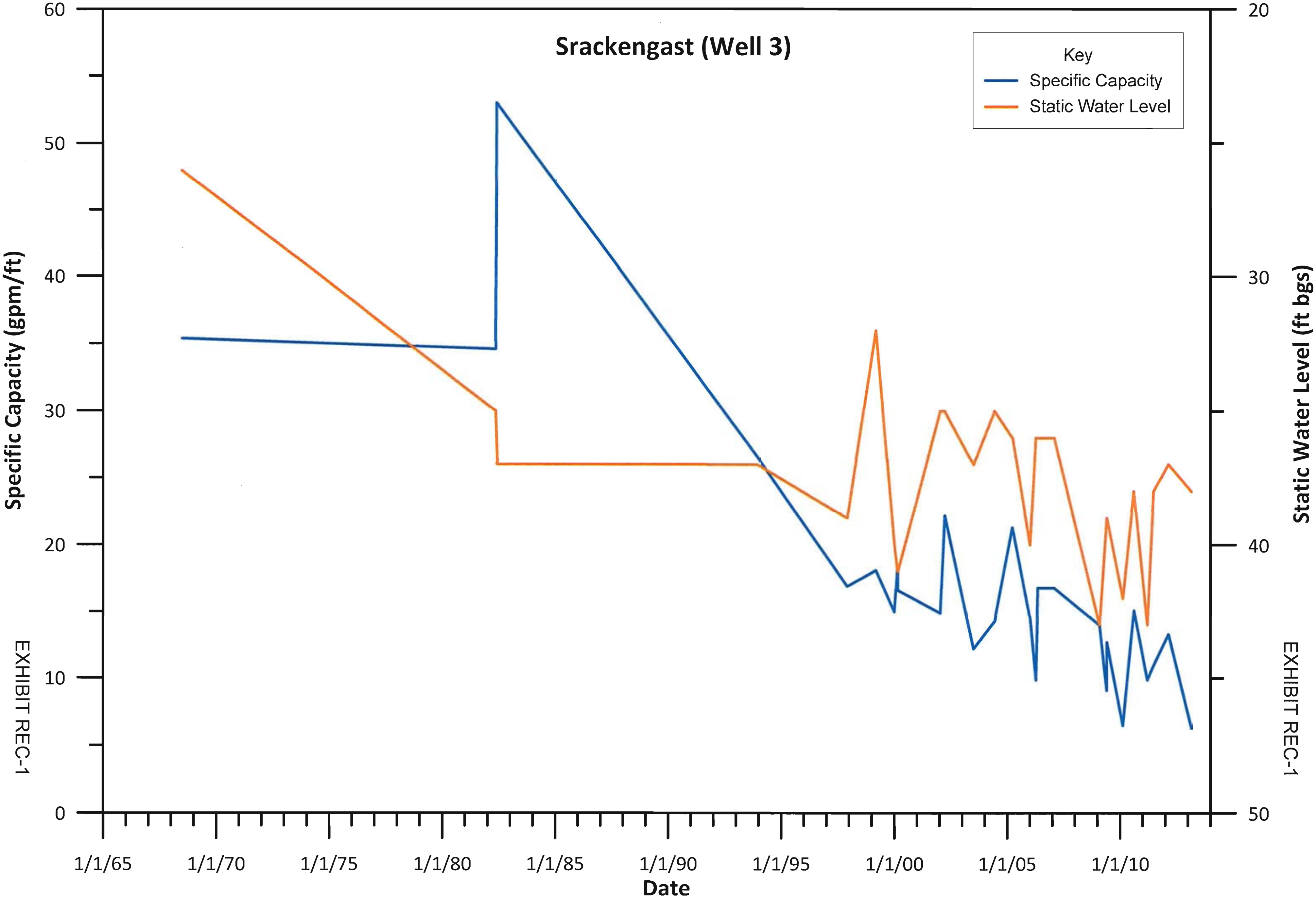


Welborn (Well 2)
Specific Capacity (gpm/ft)
Static Water Level (ft bgs)
Date
80
70
60
50
40
30
20
10
0
10
20
30
40
1/1/65
1/1/70
1/1/75
1/1/80
1/1/85
1/1/90
1/1/95
1/1/00
1/1/05
1/1/10
Key
Specific Capacity
Static Water Level
EXHIBIT REC-1
EXHIBIT REC-1



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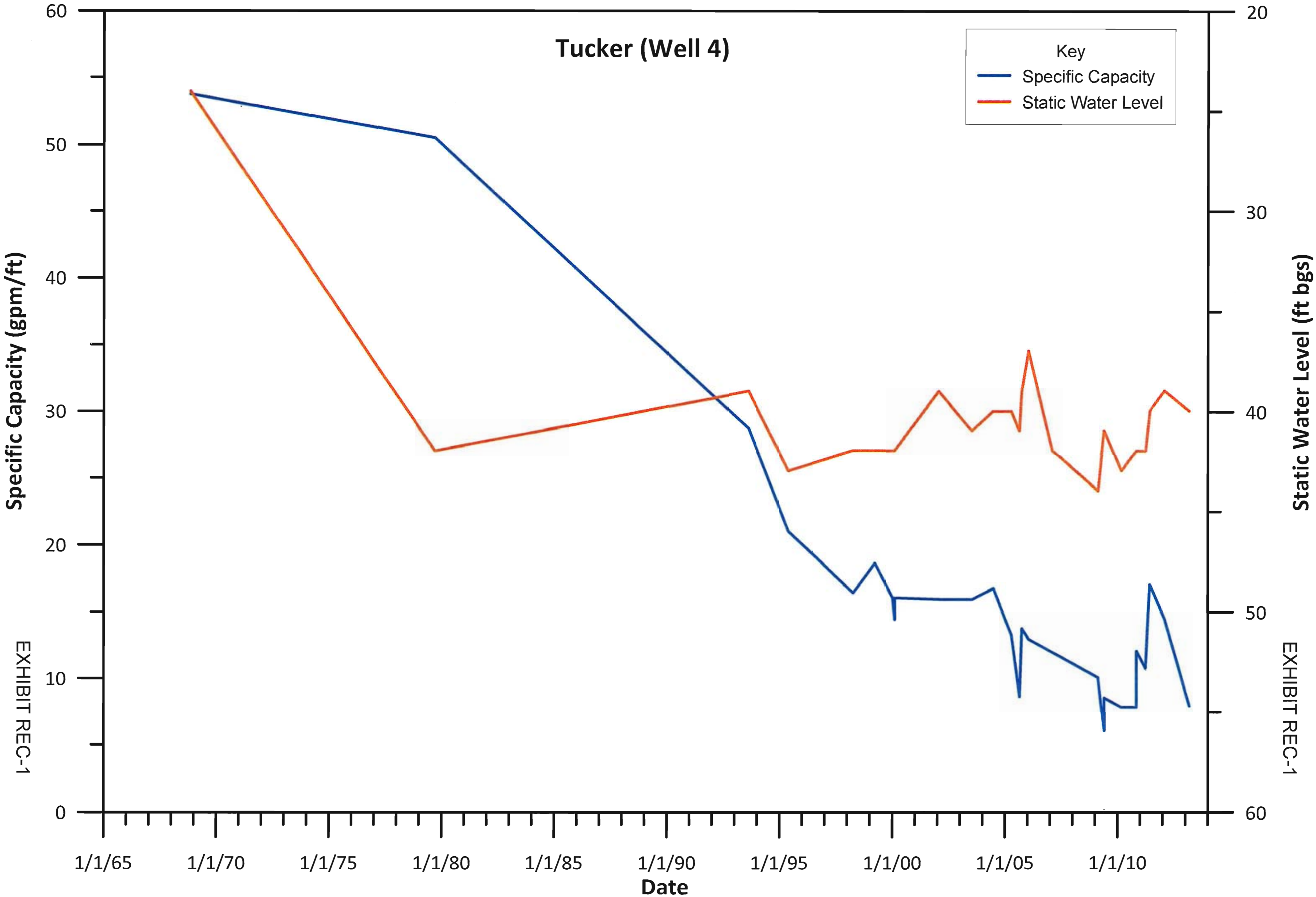

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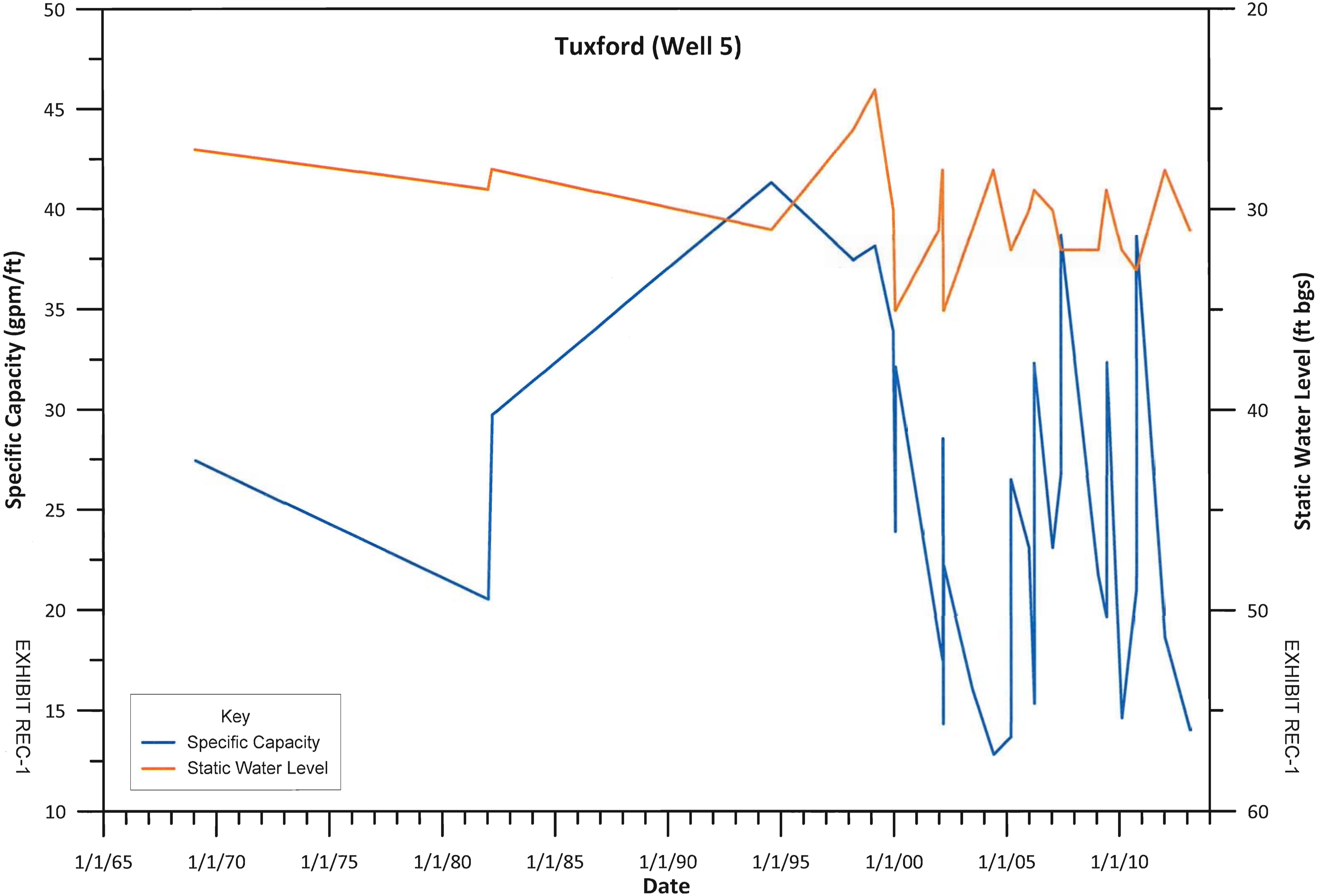

EXHIBIT REC-1

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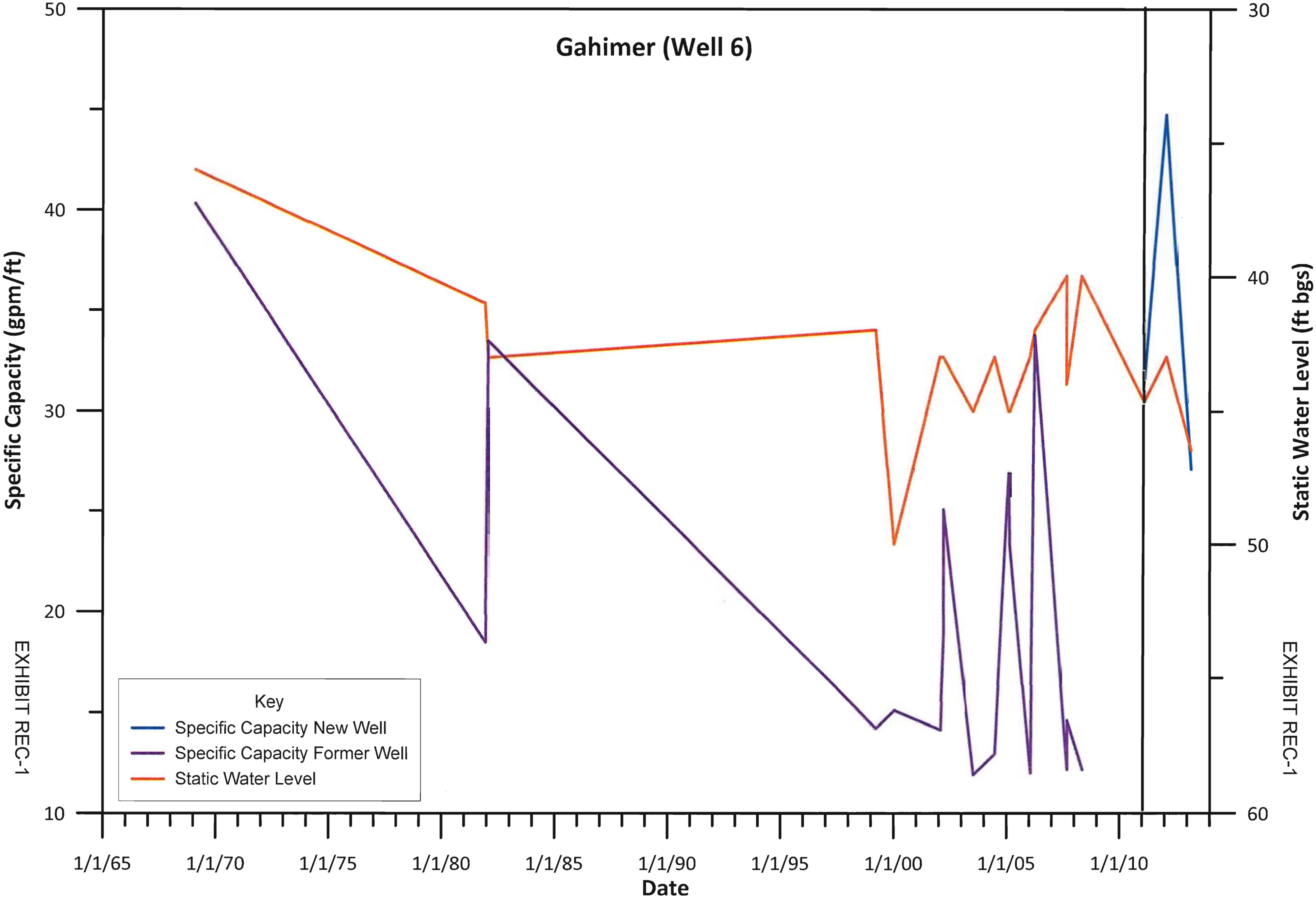

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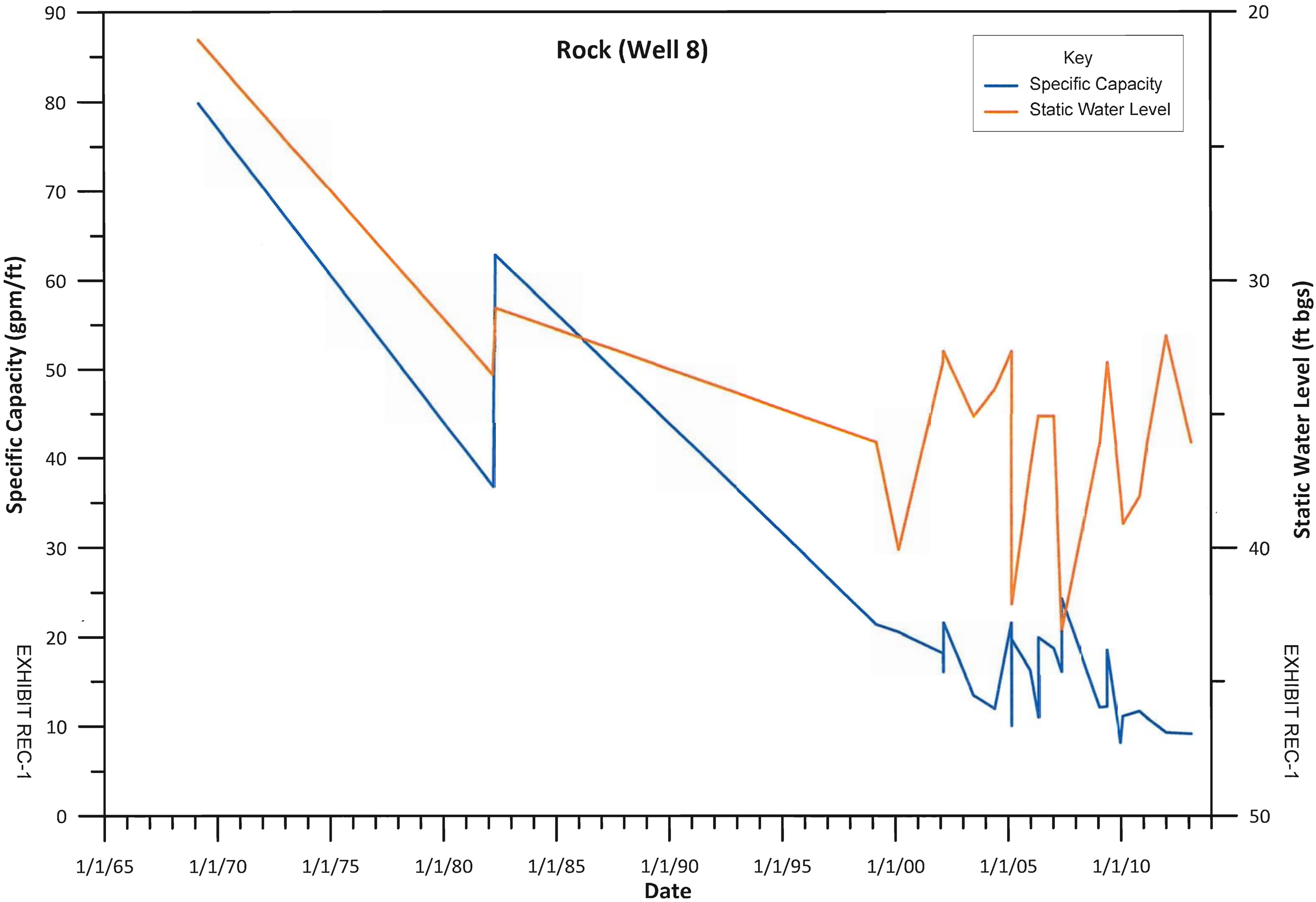

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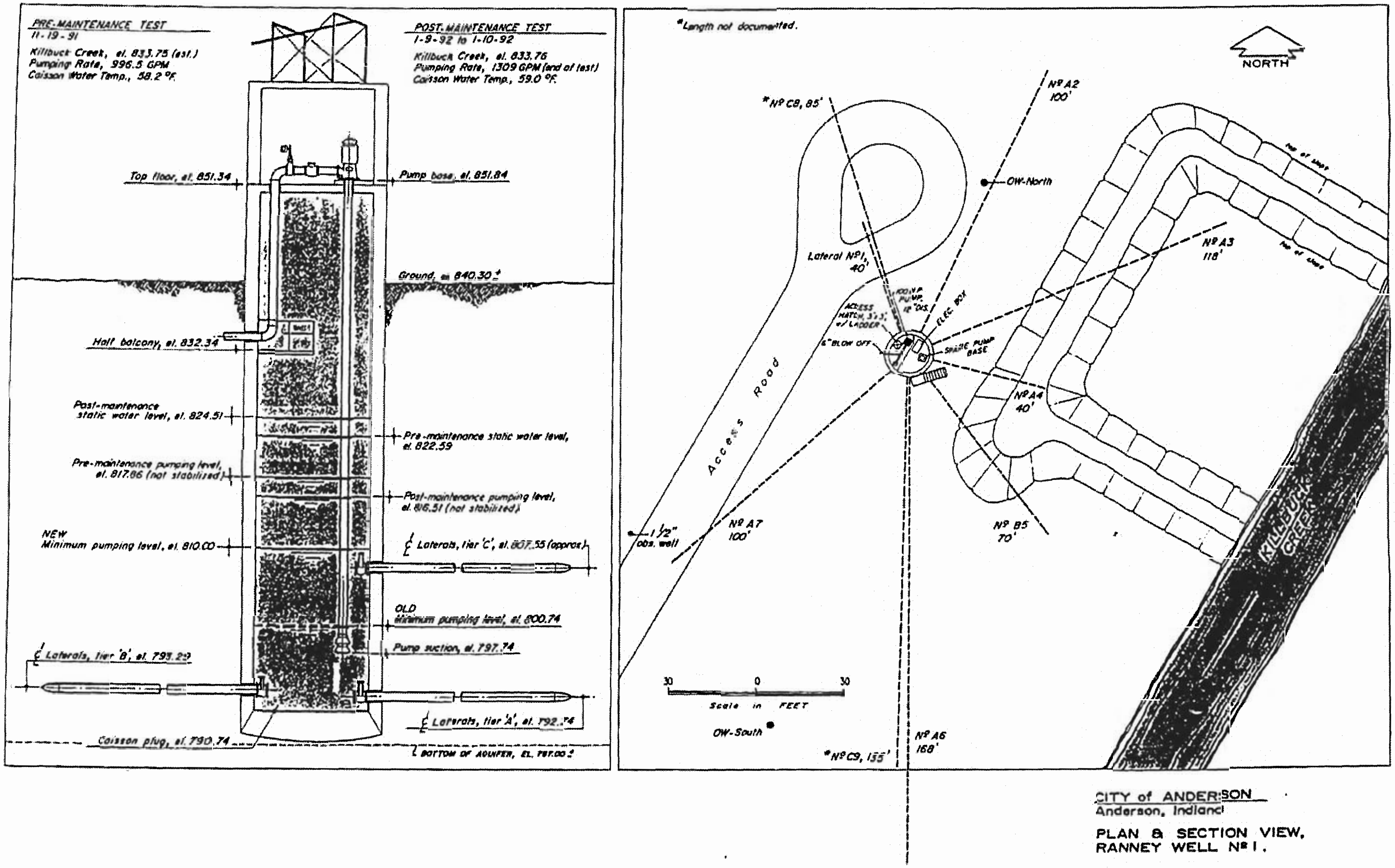
Appendix C - Well Construction Logs



CITY of ANDERSON
Anderson, Indiana

PLAN & SECTION VIEW,
RANNEY WELL Nº 1.

FIGURE 2

EXHIBIT REC-1

EXHIBIT REC-1

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Pump Installation Report

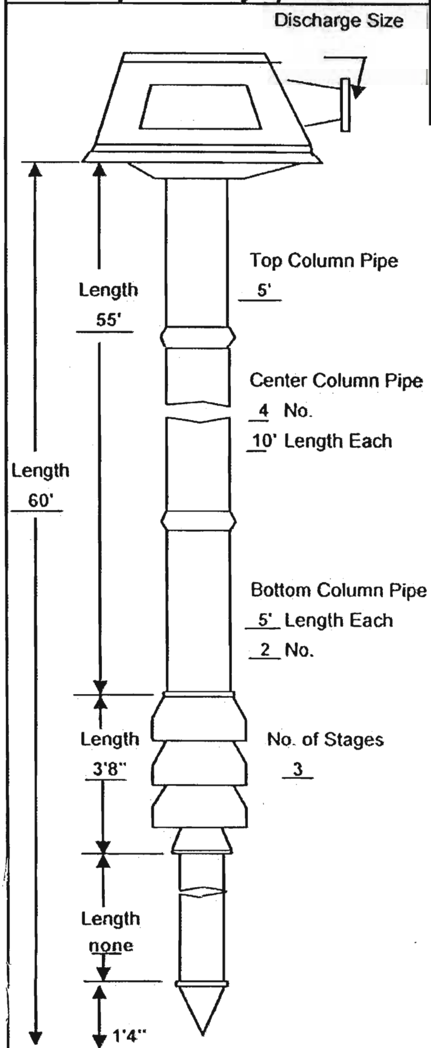
City of Anderson Ranney Well # 1

Date:	10/28/05	City, State	Anderson, Indiana
Project No.	2646-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Ranney Well # 1	Over Head Power Lines	No

Electric Motor Information

Manufacturer	US	Type	RU	Motor Shaft Threads		Frame	365TP	S/N	R6326-05-122-R3224595
Motor. Shaft Dia.	1 1/2"	Mtr. Shaft. Lgt.	35 1/4"	Right Hand		ServiceFactor		HP	75
Keyway	3/8"	Clutch Diameter	1 1/2"	Left Hand		Volts	230/460	Phase	3
RPM	1765	Upper Bearing	7220M	T.P.I.		FL Amps	182/91	Motor Repair	Yes - by client
Ratcheting		Lower Bearing	6211J			Line Voltage	460	SRC	no
CD of Motor	31 1/4"								

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	None	S/N		Gear Ratio	
Aux Eng Brand Name	None	Mod. No.		S/N	

Pump Information

Pump Head

Pump Brand	J-Line		
Discharge Head Type	SPC10		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	Threaded	X
Base Plate	No		
Pump Top Shaft Lgt.	68"		
Diameter	1 1/2"		
Pin Sz. At Hd.	1 1/2"		

Column Pipe

Coupling	C.I.	
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	10"	
Flanged		No
Special Paint		No
Water Lube		Yes
Shaft Size	1 1/2"	SS

Bowl Assembly

Design GPM	1200	@ TDH	204'
Bowl Assembly Type	12MCP3		
Shell Diameter	12"		
Shell Material	C.I.	X	BZ.
Impeller Shaft Diameter	1 1/2"		
Shaft Length	NA	Imp. Material	SS

Note: Replaced column pipe and shafting.
Rebuilt bowl assembly.

Suction Pipe

Suction Size	None	Threads On Btm.	
Length		Special Paint	

Flow Test

SWL		Op. Pressure	75#
GPM		PL	
D.D.		Spec. Cap.	
Water Discharge to:		Open thru orifice	

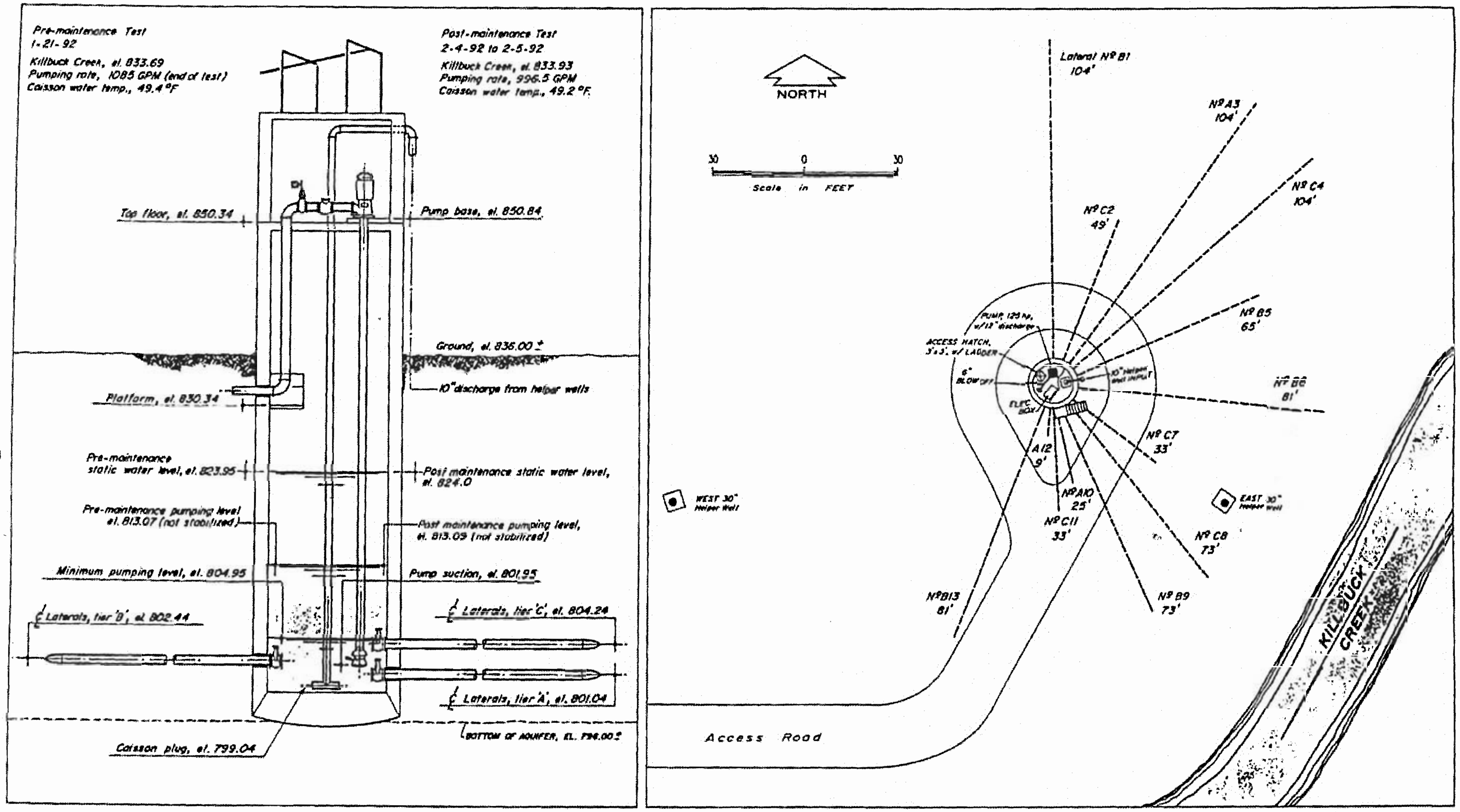
Well Data

Depth	61'10"	Type Well	GWW	Screen Diameter	
Inside Dia.	22 3/4"		Tube	Screen Length	
Tower Height	Caison			Screen Open Size	

Misc. Data

Bowls Repaired	
Pump Repaired Last	2000
Pump Off Size	

Installers:
Greg Procell, John Mayer & John Britton



CITY OF ANDERSON
Anderson, Indiana

PLAN & SECTION VIEW,
RANNEY WELL Nº 2.

FIGURE 3

EXHIBIT REC-1

EXHIBIT REC-1

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Pump Installation Report

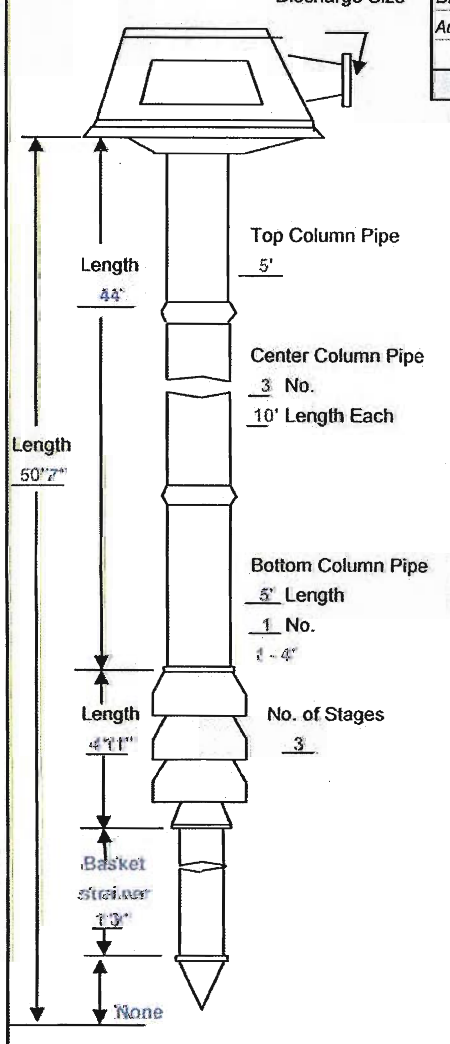
City of Anderson Ranney Well # 2

Date:	3/20/06	City, State	Anderson, Indiana
Project No.	2646-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Ranney Well # 2 - by creek	Over Head Power Lines	No

Electric Motor Information

Manufacturer	US	Type	RU	Motor Shaft Threads		Frame	445TP	S/N	CC2140025-280-88-00317
Motor. Shaft Dia.	1 15/16"	Mtr. Shaft. Lgt.	49"	Right Hand		ServiceFactor	1.15	HP	125
Keyway	3/8"	Clutch Diameter	1 15/16"	Left Hand	X	Volts	460	Phase	3
RPM	1775	Upper Bearing	7322M	T.P.I.	10	Amps	146	Motor Repair	Yes - by client
Ratcheting	NRR	Lower Bearing	6215J	1 11/16" x 1 15/16"		Line Voltage	460	SRC	no
CD of Motor	42 5/8"								

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	None	S/N		Gear Ratio	
Aux Eng Brand Name	None	Mod. No.		S/N	

Pump Information

Pump Head

Pump Brand	Simmons bowls, Peerless head		
Discharge Head Type	Peerless 12x12x20		
Discharge Line Size	12"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	X	Threaded
Base Plate	No		
Pump Top Shaft Lgt.	72"		
Diameter	1 11/16"		
Pin Sz. At Hd.	1 11/16"		

Pump S/N: 47076

Column Pipe

Coupling	C.I.	X
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	10"	
Coupled x CI cplgs		
Special Paint		No
Water Lube		Yes
Shaft Size	1 11/16" SS	

Note: Basket and Strainer installed.

Bowl Assembly

Design GPM	1750	@ TDH	222'
Bowl Assembly Type	3 stage SM14L		
Shell Diameter	14"		
Shell Material	C.I.	X	BZ.
Impeller Shaft Diameter	2 3/16" pin 1 11/16" 10thd		
Shaft Length	NA	Imp. Material	Brz

Suction Pipe

Suction Size	None	Threads On Btm.	
Length		Special Paint	

Flow Test

SWL	25'	Op. Pressure	95#
GPM *	1,125	PL	27.5'
D.D.	2.5'	Spec. Cap.	450
Water Discharge to:		system	

* GPM as plotted on pump curve according to TDH.

Note: Meter reads at 750 GPM +/-

Well Data

Depth	50'10"	Type Well	GWW	Screen Diameter	
Inside Dia.	20 1/2"		Tube	Screen Length	
Tower Height		Ranney		Screen Open Size	

Misc. Data

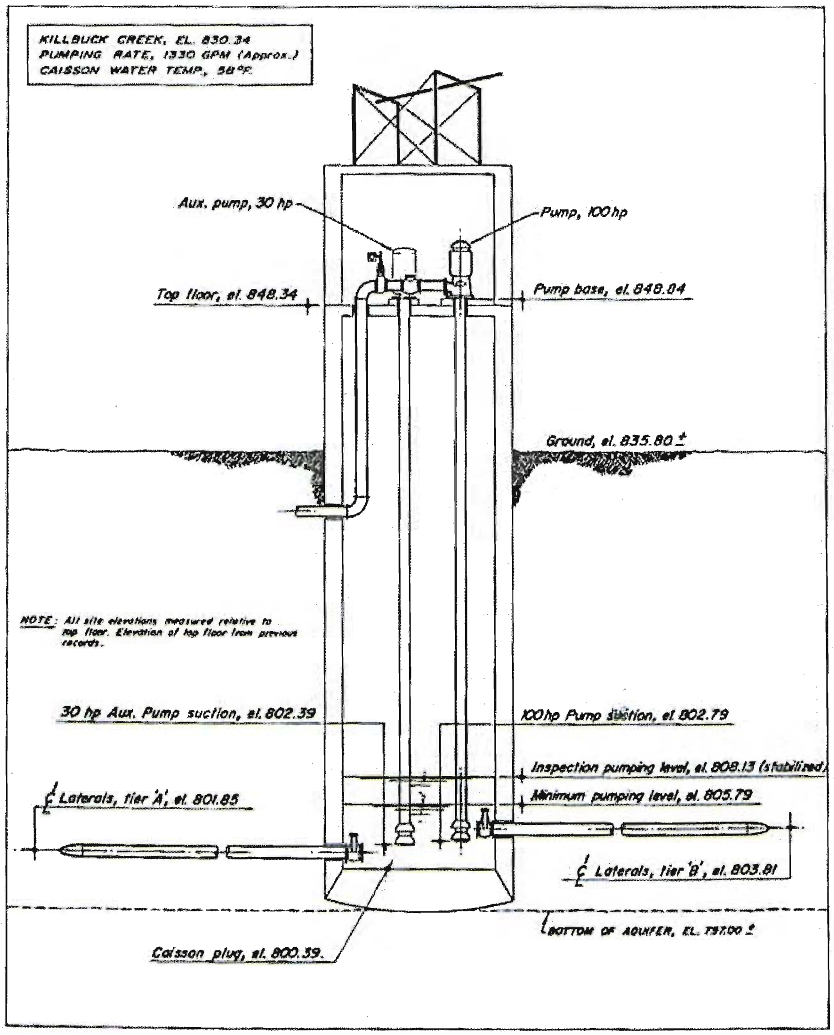
Note: Jump coupling in head; new column pipe with CI cplgs 12-05

New bowl assembly 3-06

Well Cleaned Last	1992
Pump Repaired Last	2005
Pump Off Size	

Installers:

Greg Procell, John Mayer & Kraig Cummings



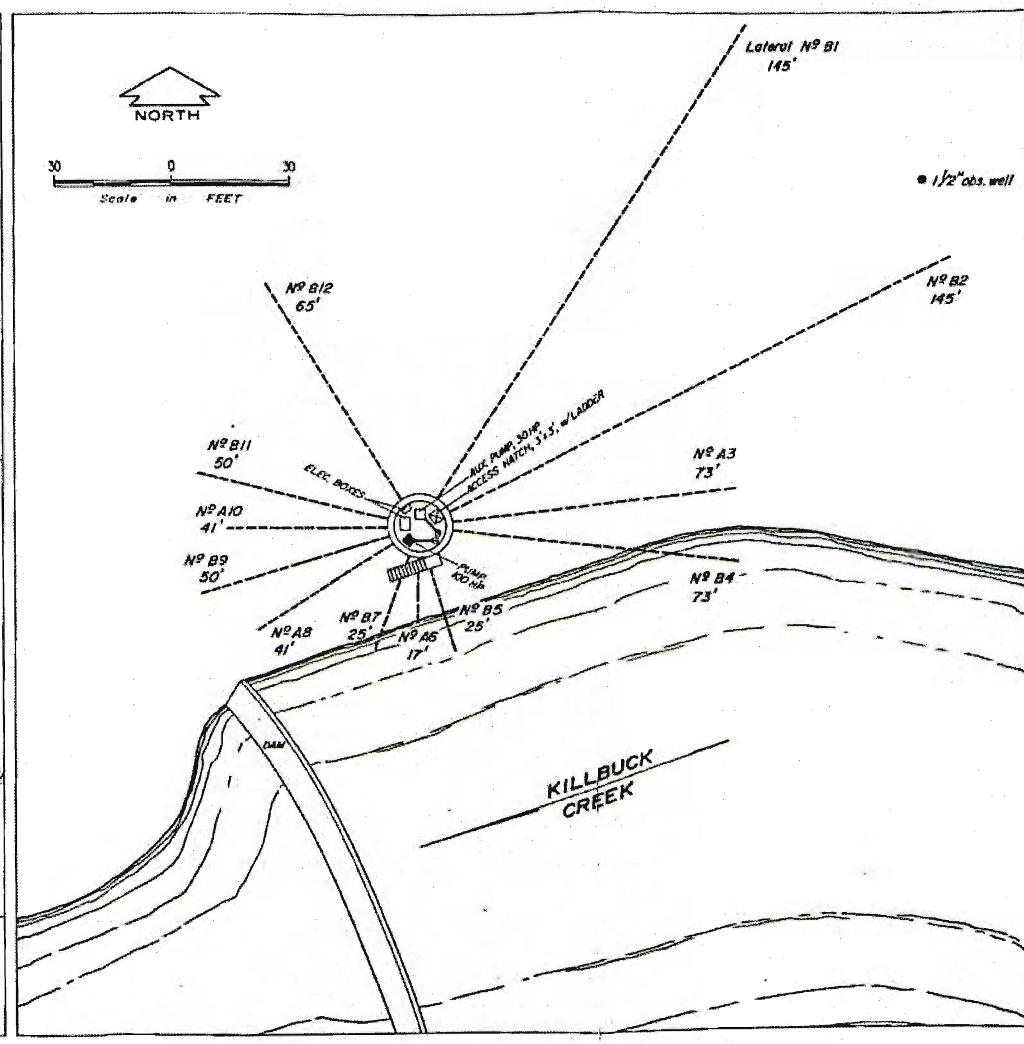


EXHIBIT REC-1

CITY OF ANDERSON
Anderson, Indiana

PLAN & SECTION VIEW, RANNEY WELL Nº 4.

Dwg. Nº AI-WI-4

EXHIBIT REC-1

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

PUMP INSTALLATION PRINT

WELL NO. Ranney #4 DATE August 19, 1997.

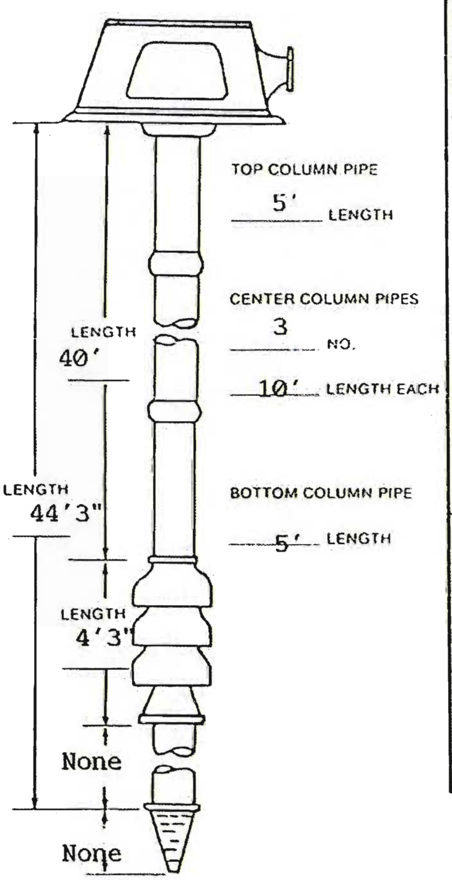
CUSTOMER City of Anderson CITY Anderson, Indiana.

PROJECT NO. 1677-F PUMP BRAND Simmons S/N5701-97GPUMP PULLED/Hydrocrane

WELL/PUMP LOCATION By Frisch's Restaurant POWER LINE Yes.

Electric Motor Brand Name US Type RU Frame 405UP S/N 3837015.
Design 1,200 GPM Pin size at Head 1 1/2" Motor Shaft Dia. 1 1/2".
Capacity 200' TDH Keyway 3/8" Motor Shaft Length 40".
H.P. 75 Volts 460 Amps 75' RPM 1770 Line Voltage 460 Phase 3.
Upper Bearing Oil Motor Repaired Yes SRC No.
Lower Bearing Grease C.D. of Motor 38' Clutch Dia. 1 1/2 NRRYes.

Angle Gear Drive Brand Name ______ S/N ______ Gear Ratio ______.
Auxillary Engine Brand Name ______ Model No. ______ S/N ______.



Discharge head Type SPC10
Discharge Line Size 10"
Location above grade
Column to Head thd
Base Plate No
Pump Top Shaft 66" Length
Coupled above
Diameter 1 1/2"

Column Pipe Size 10"
Flanged ______ Coupled x
Special Paint no
Water Lube
Shaft Size 1 1/2" SS
Tubing Size
STL BRZ

Bowl Assembly Type SJ12MT
Shell Dia. 12" Stages 3
Shell Material C.I.
Imp. Shaft Dia. 1 11/16"
Material X S.S.
Length N/A

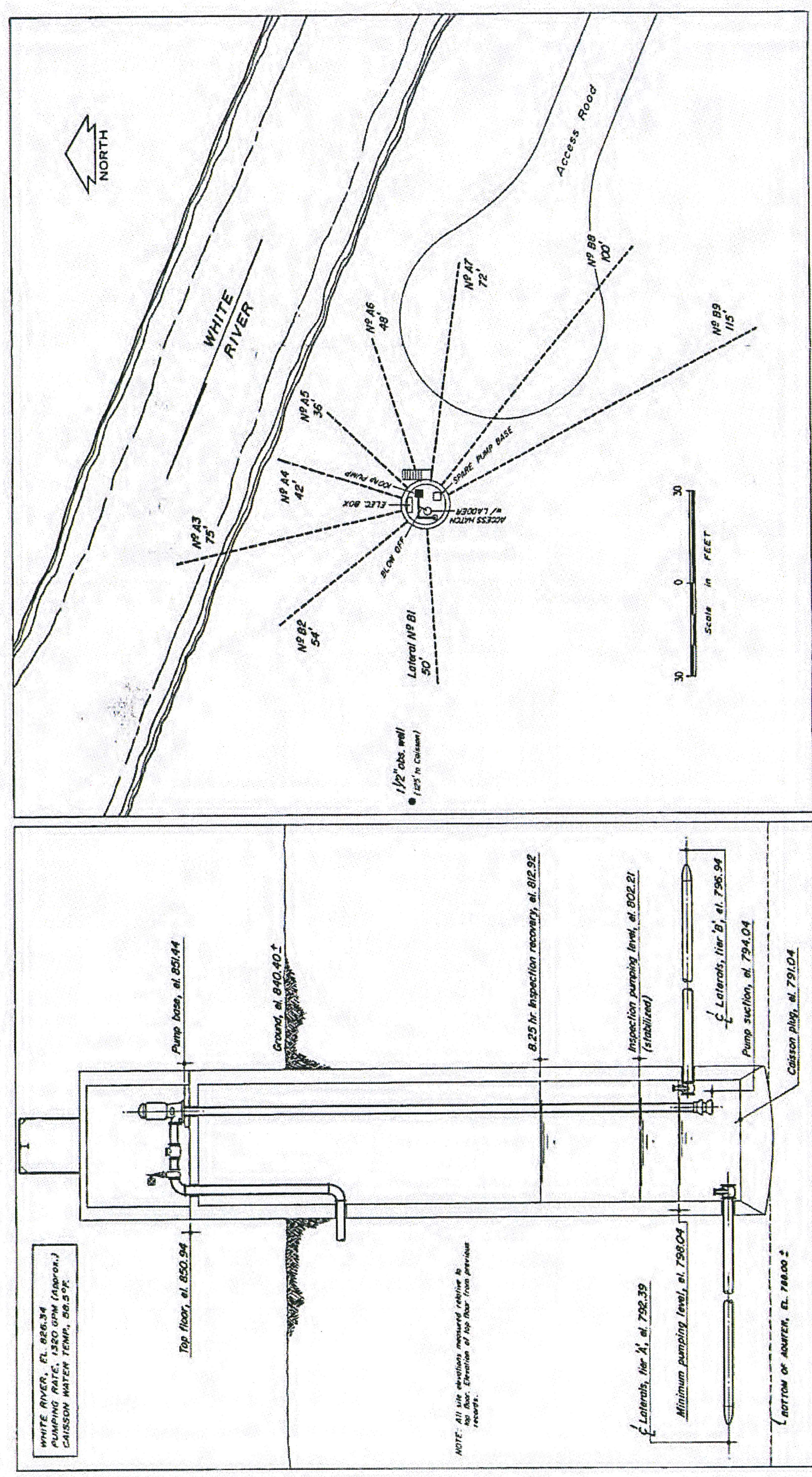
Suction Pipe size None.
Special Paint ______.
Length ______.
Threads on Bottom None
Strainer None
Rubber Bumper None
Well Seal None

WELL DATA FROM PUMP HEAD BASE RANNEY COLLECTOR

Inside Dia. ____ Depth ______ Static _____ Type Well
Airline Materials ______ Size ______ O.D. Attached?
Tower HeightCaisonSystem Operating Pressure 75#.
Pumping Test 1250 gpm @ 26'6" ft. Pumping Level
with 75 # discharge pressure after 1 hour(s)
Water Discharge To: Open thru Orifice AMPS 88-88-84.

Pump Repaired Last 1992.
Well Cleaned Last ______.

Installers: Greg Procell.



CITY OF ANDERSON
Anderson, Indiana

PLAN & SECTION VIEW,
RANNEY WELL Nº 5.

Dwg. Nº AI-WI-5

EXHIBIT REC-1

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, IN 46131
(317) 738-4577
FAX: (317) 738-9295

Pump Installation Report

City of Anderson - Ranney #5

Date:	6/13/11	City, State	Anderson, Indiana
Project No.	3371-F	Pulling Equipment	Hydrocrane
Well Pump Loc.		Over Head Power Lines	Yes

Electric Motor Information

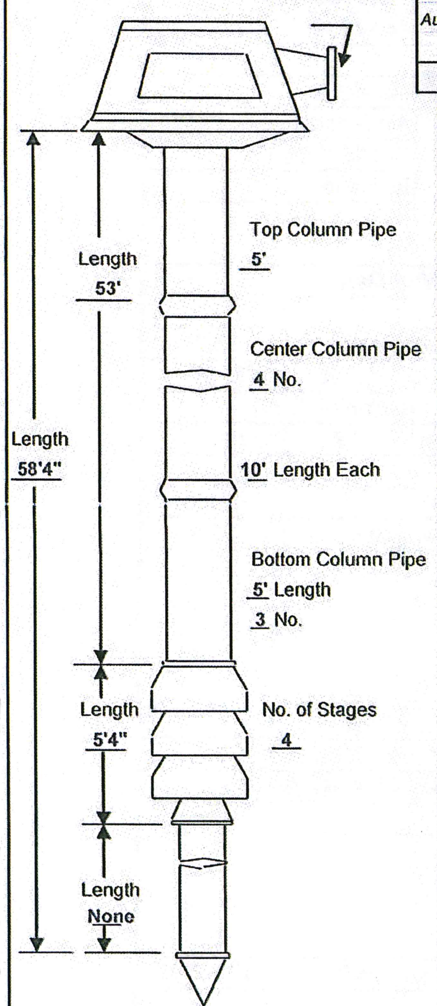
Manufacturer	US	Type	RUSI
Motor. Shaft Dia.	1 1/2"	Mtr. Shaft. Lgt.	45"
Keyway	3/8"	Clutch Diameter	1 1/2"
RPM	1785	Upper Bearing	7222-BEM
Ratcheting	Yes	Lower Bearing	6212-J
CD of Motor	37"		

Motor Shaft Threads	
Right Hand	
Left Hand	X
T.P.I.	10

*Motor originally on Hanna Well

Frame	404 TP	S/N	P047334875-0028
ServiceFactor	1.15	HP	100
Volts	460	Phase	3
FL Amps	114	Motor Repair	Yes
Line Voltage	460	SRC	No

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	None	S/N		Gear Ratio	
Aux Eng Brand Name	None	Mod. No.		S/N	

Pump Information

Pump Head

Pump Head Mfr.	Simmons		
Discharge Head Type	SP10		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	Threaded	X
Base Plate	No		
Pump Top Shaft Lgt.	68 1/2"		
Diameter	1 1/2"		
Pin Sz. At Hd.	1 12"		
Pump Brand	Simmons		

Column Pipe

Coupling	C.I.	X
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	10"	
Screwed		X
Water Lube		X
Shaft Size	S.S. 1 1/2"	

Bowl Assembly

Design GPM	1,200	@ TDH	260'
Bowl Assembly Type	SJ12MT		
Shell Diameter	12"-4 stages		
Shell Meterial	C.I.	X	BZ.
Stickup	10"		
Serial No.	1287-11A		
Bowl Shaft Mat.	S.S.	X	Diam 1 11/16"

Suction Pipe

Suction Size	None	Threads On Btm.	
Length		Special Paint	

Flow Test

SWL	28'	Op. Pressure	
GPM		PL	31.4'
D.D.		Spec. Cap.	
Amps		TDH	

Minimium Submergence Above The Eye Of The Bottom Of Impeller

Well Data

Depth	60'4"	Type Well	GWW	Screen Diameter	
Inside Dia.		Ranney	Tube	Screen Length	
Tower Height		Airline mat'ls		Screen Open Size	

Misc. Data

Pump Repaired Last	1995
Well Repaired Last	10"
Pump Off Size	

Installer:

Greg Procell
John Mayer, Jr.

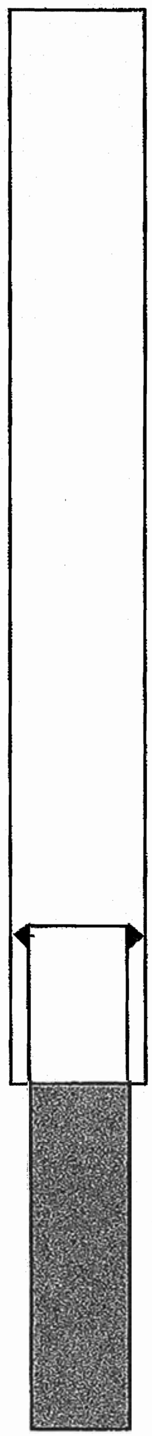
BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Tubular Well Print

City of Anderson Elder Street Well

Tower Height		
Pipe extends	2'-0"	feet above ground level.



Pipe size 24"

Wall Thickness .500"

Depth 76'4"

K-packer expanded against pipe

Blank Tube Size

Length 2'8"

Depth 79'4"

Well Screen Johnson

Type	SSWW Hi-Flow
	20 7/8 ID
Slot size	*see below
2'8"	blank & packer
3'	.070" slot
9'	.130"
3'	Blank
3'	.100"

Depth 97'

Customer Information

Job #:	2804-F
Customer:	City of Anderson
Tubular Well No.	Elder Street Well

Customer Location

Location from street or road:
50' North of old Lawler Well,
165' west of Killbuck Creek,
end of Elder Street

UTM 16T	0613153
UTM	4442835
County	Madison
Township	Anderson
Section	6 T19N R8E
State	Indiana

Well Data

Static Water Level		13.2'
Pumped	1,005	GPM at
62.85'	pumping level	
after	12	hours
Drawdown		49.65'
Specific Capacity		20.2

Driller(s):

Delford Dunn License # 189
Jim Parsley License # 2058

Date Completed:	3/1/2007

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, IN 46131
(317) 738-4577
FAX: (317) 738-9295

Pump Installation Report

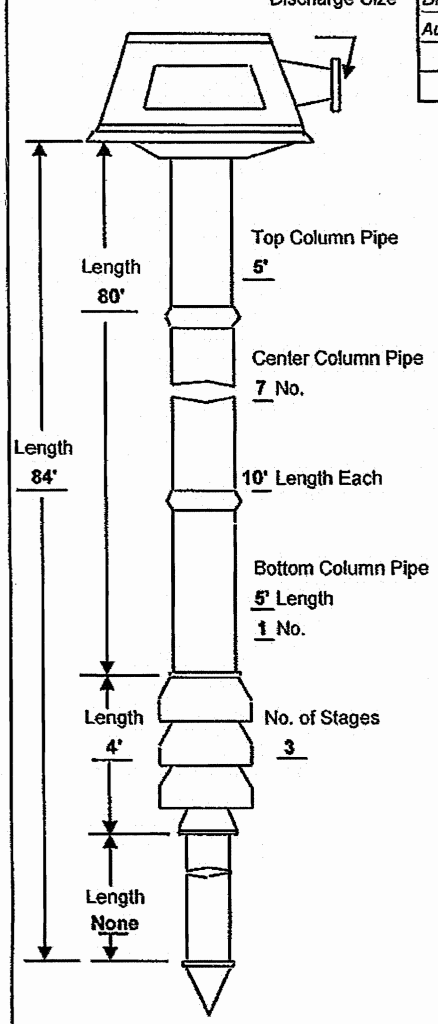
City of Anderson - Elder Street - Well #1

Date:	6/9/10	City, State	Anderson, Indiana
Project No.	3214-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	1st well in wellfield	Over Head Power Lines	Yes

Electric Motor Information

Manufacturer	US	Type	RUSI	Motor Shaft Threads		Frame	365 TP	S/N	L02-BF61AM
Motor. Shaft Dia.	1 3/16"	Mtr. Shaft. Lgt.	38"	Right Hand		ServiceFactor	1.15	HP	75
Keyway	1/4"	Clutch Diameter	1 3/16"	Left Hand	X	Volts	460	Phase	3
RPM	1780	Upper Bearing	7220-BEP	T.P.I.	8'	FL Amps	87	Motor Repair	Yes
Ratcheting	Yes	Lower Bearing	6211-J			Line Voltage	460	SRC	No
CD of Motor	31 3/4"								

Pump Assembly Specifics



Right Angle Drive Information

Brand Name		S/N		Gear Ratio	
Aux Eng Brand Name		Mod. No.		S/N	

Pump Information

Pump Head

Pump Head Mfr.	L & B		
Discharge Head Type	TF818		
Discharge Line Size	8"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	X	Threaded
Base Plate	Yes		
Pump Top Shaft Lgt.	62"		
Diameter	1 3/16"		
Pin Sz. At Hd.	1 3/16"		
Pump Brand	Hydroflow		

Column Pipe

Coupling	C.I.	
	S.T.	X
Spiders	Drop - In	X
	Screw - In	
Col. Pipe Size	8"	
Screwed		X
Water Lube		X
Shaft Size	1 3/16"	

Bowl Assembly

Design GPM	1,000	@ TDH	225'
Bowl Assembly Type	12KC 3-570		
Shell Diameter	12"		
Shell Meterial	C.I. X	BZ.	
Stickup	12"		
Serial No.	G32162	1 3/16" pin	
Bowl Shaft Mat.	S.S. X	Diam	1 11/16"

Suction Pipe

Suction Size		Threads On Btm.	
Length		Special Paint	

Flow Test

SWL	24'	Op. Pressure	80#
GPM	824	PL	68'
D.D.	22'	Spec. Cap.	18.7
Amps		TDH	

Minimium Submergence Above The Eye Of The Bottom Of Impeller

Note: #2 Well Was Running

Well Data

Depth	105'6"	Type Well	GWW		Screen Diameter	20 7/8"
Inside Dia.	24"		Tube	X	Screen Length	68'
Tower Height	8'	Airline mat'ls			Screen Open Size	.070"-.130"-.100"

Misc. Data

3'-9'-3'

Installer:
Greg Procell
Jim Parsley

Pump Repaired Last	New
Well Repaired Last	2009
Pump Off Size	8"

BASTIN LOGAN WATER SERVICES INC.

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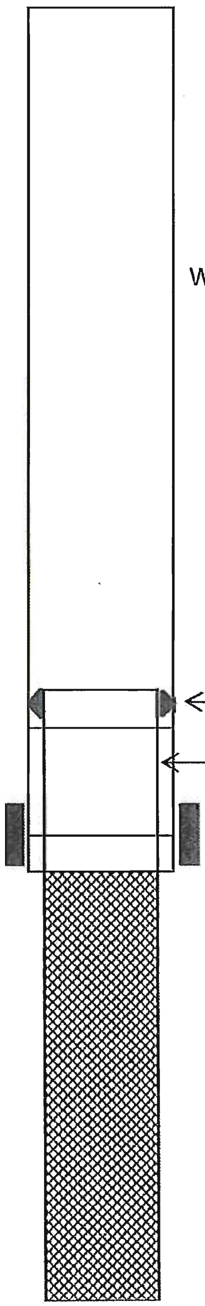
Tubular Well Print

City of Anderson - Elder Street Well #2

Tower Height	13'-0"	
Pipe Extends	13'-0"	feet above ground level

Measurements from top of 24" pipe-36" from grade



Pipe Size 24"
Wall Thickness .500"

Depth 91'-7"
K-packer expanded against pipe

Blank Tube

Size 21" ID
Depth 93'
Length 1'5"

Steel Drive Shoe

Well Screen
Type SS Johnson
Slot Size .100

Depth 114'-7"

Customer Information	
Job #	3266-F
Customer:	
City of Anderson	
Well No.	#2-Elder Street
Customer Location	
Location from street or road:	
Approx. 288' north of Ranney	
Collector - 130' west of creek.	
UTM16S	0613154
UTM	4442942
County	Madison
Township	19N
Section	6
State	Indiana
Range	8E

Well Data		
Static Water Level		18.21
Pumped	1,209	GPM at
37.31	Pumping Level	
After	24	Hours
Drawdown		19.1'
Specific Capacity		63.2
Drillers:		
Delford Dunn		
Date completed		

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(317) 738-4577
FAX: (317) 738-9295

Pump Installation Report

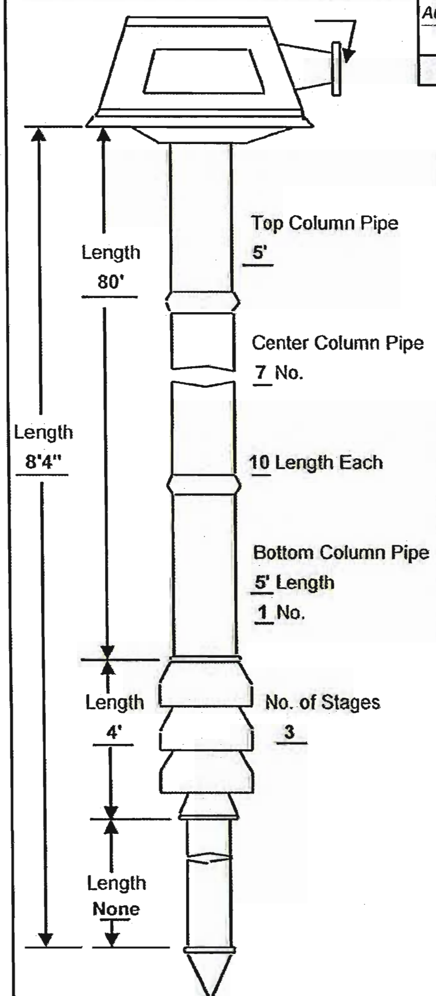
City of Anderson - Elder Street #2

Date:	1/14/10	City, State	Anderson, Indiana
Project No.	3266-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	#2 Elder Street	Over Head Power Lines	No

Electric Motor Information

Manufacturer	US	Type	RUSI	Motor Shaft Threads		Frame	364TP	S/N	P037347583-0046M0012
Motor. Shaft Dia.	1 1/2"	Mtr. Shaft. Lgt.	37 3/4"	Right Hand		ServiceFactor	1.15	HP	60
Keyway	3/8"	Clutch Diameter	1 1/2"	Left Hand	X	Volts	460	Phase	3
RPM	1780	Upper Bearing	7220 BEP	T.P.I.	10	FL Amps	70	Motor Repair	New
Ratcheting	Yes	Lower Bearing	6211 J			Line Voltage	460	SRC	No
CD of Motor	31"								

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	None	S/N	N/A	Gear Ratio	N/A
Aux Eng Brand Name	None	Mod. No.	N/A	S/N	N/A

Pump Information

Pump Head

Pump Head Mfr.	Simmons		
Discharge Head Type	SPC8		
Discharge Line Size	8"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	Threaded	X
Base Plate	Yes		
Pump Top Shaft Lgt.	63 1/2"		
Diameter	1 1/2"		
Pin Sz. At Hd.	1 1/2"		
Serial No	52130-09L		

Column Pipe

Coupling	C.I.	X
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	8"	
Flanged		110
Special Paint		110

Bowl Assembly

Design GPM	700	@ TDH	210		
Bowl Assembly Type	SL12M				
Shell Diameter	12"				
Shell Meterial	C.I.	X	BZ.		
Impeller Shaft Diameter	1 11/16" pin 1 1/2"				
Shaft Length	N/A				
Bowl Shaft Mat.	S.S.	X	Diam	1 11/16"	

Suction Pipe

Suction Size	None	Threads On Btm.	
Length		Special Paint	

Flow Test

SWL	26'5"	Op. Pressure	
GPM		PL	
D.D.		Spec. Cap.	
Amps		TDH	

Minimium Submergence Above The Eye Of The Bottom Of Impeller

Well Data

Depth	115'5"	Type Well	GWW		Screen Diameter	21" ID
Inside Dia.	24"		Tubular	X	Screen Length	21'
Tower Height	12'	Airline mat'ls			Screen Open Size	.100

Misc. Data

Installer: Greg Procell

Pump Repaired Last	New
Well Repaired Last	New
Pump Off Size	8"

Casing extends 2 feet above ground level.

Job No. C-21323

Location from Street or Road

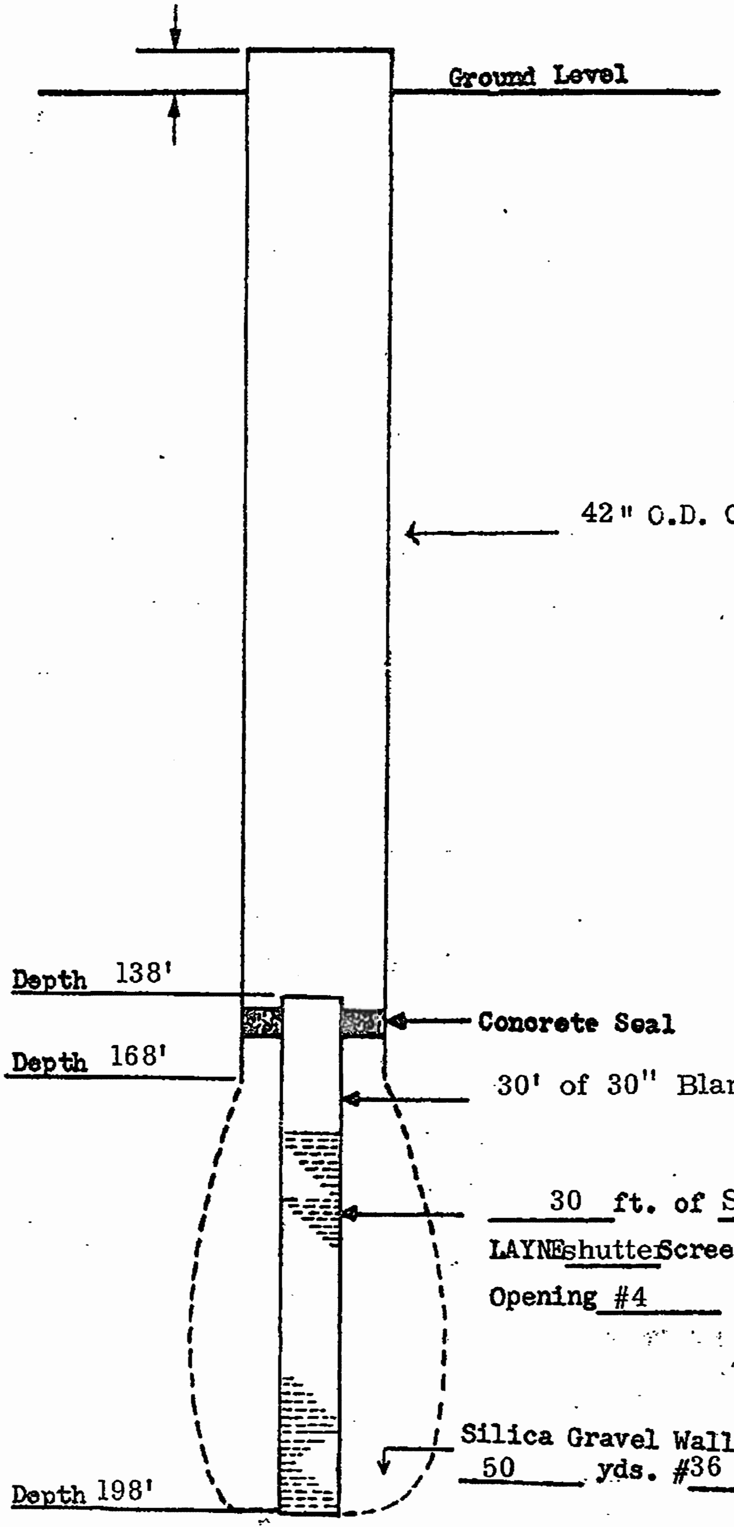
Approx. 2440' N. of Road 300N

Approx. 2440' E. of Road 500W

County Madison

Township Lafayette

Section 29, T20N, R7E



HALL FARM

Single Cased
LAYNE GRAVEL WALL WELL No. 1
For
CITY OF ANDERSON
ANDERSON, INDIANA

Driller Hoyt Foster

Date Finished November 20, 1968

Not drawn to Scale
All depths measured
from ground level

Static Level 25
Pumped 2,060 GPM
at 66' Pumping Level

LAYNE NORTHERN CO. INC.
MISHAWAKA, INDIANA

DRAWN BY APPROVED BY DATE	DRAWING NO.

EXHIBIT REC-1

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, IN 46131
(317) 738-4577
FAX: (317) 738-9295

Pump Installation Report

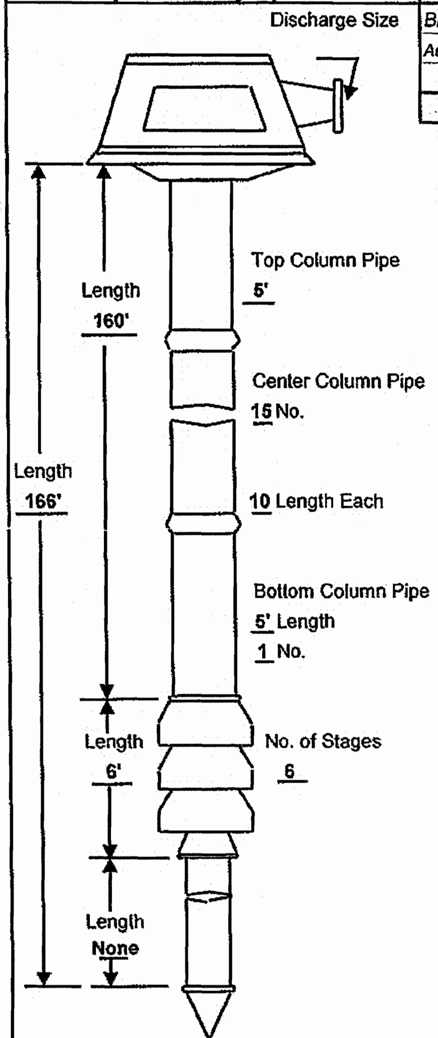
City of Anderson - Hall Well

Date:	2/19/10	City, State	Anderson, Indiana
Project No.	3214-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Hall Well	Over Head Power Lines	Yes

Electric Motor Information

Manufacturer	US	Type	RU	Motor Shaft Threads		Frame	B444UPH	S/N	C2884-00-269
Motor. Shaft Dia.	1 1/2"	Mtr. Shaft. Lgt.	41"	Right Hand		ServiceFactor	1.15	HP	0
Keyway	3/8"	Clutch Diameter	1 1/2"	Left Hand	X	Volts	460	Phase	3
RPM	1770	Upper Bearing	7322 M	T.P.I.	8	FL Amps	122	Motor Repair	No
Ratcheting	Yes	Lower Bearing	6213J			Line Voltage	460	SRC	No
CD of Motor	27"								

Pump Assembly Specifics



Right Angle Drive Information

Brand Name		S/N		Gear Ratio	
Aux Eng Brand Name		Mod. No.		S/N	

Pump Information

Pump Head

Pump Head Mfr.	L & B		
Discharge Head Type	T302		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	X	10x8 Reducer
Base Plate	Yes		
Pump Top Shaft Lgt.	64"		
Diameter	1 3/16"		
Pin Sz. At Hd.	1 3/16"		
Serial No	1154-10A		

Column Pipe

Coupling	C.I.	X
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	8"	
Flanged		No
Special Paint		No

Bowl Assembly

Design GPM	600	@ TDH	300'	
Bowl Assembly Type	SM10H			
Shell Diameter	10"			
Shell Meterial	C.I.	X	BZ.	
Impeller Shaft Diameter	1 1/2" x 1 3/16"pin			
Shaft Length	N/A			
Bowl Shaft Mat.	S.S.	X	Diam	

Suction Pipe

Suction Size	None	Threads On Btm.	
Length		Special Paint	

4-19-10 Flow Test

SWL	44'	Op. Pressure	80#
GPM	578	PL	121'
D.D.	77'	Spec. Cap.	7.5
Amps	80-70-97	TDH	306'

Minimium Submergence Above The Eye Of The Bottom Of Impeller

12" Constant/18" Liner

Well Data

Depth	194'	Type Well	GWW	X	Screen Diameter	30"x18"
Inside Dia.	17 1/2"		Tube		Screen Length	30'
Tower Height	None	Airline mat'ls	None		Screen Open Size	.100

Misc. Data

1 3/16" S.S. shafting 8 thread

Installer: Greg Procell
John Mayer, Jr.

Pump Repaired Last	2010
Well Repaired Last	2010
Pump Off Size	

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
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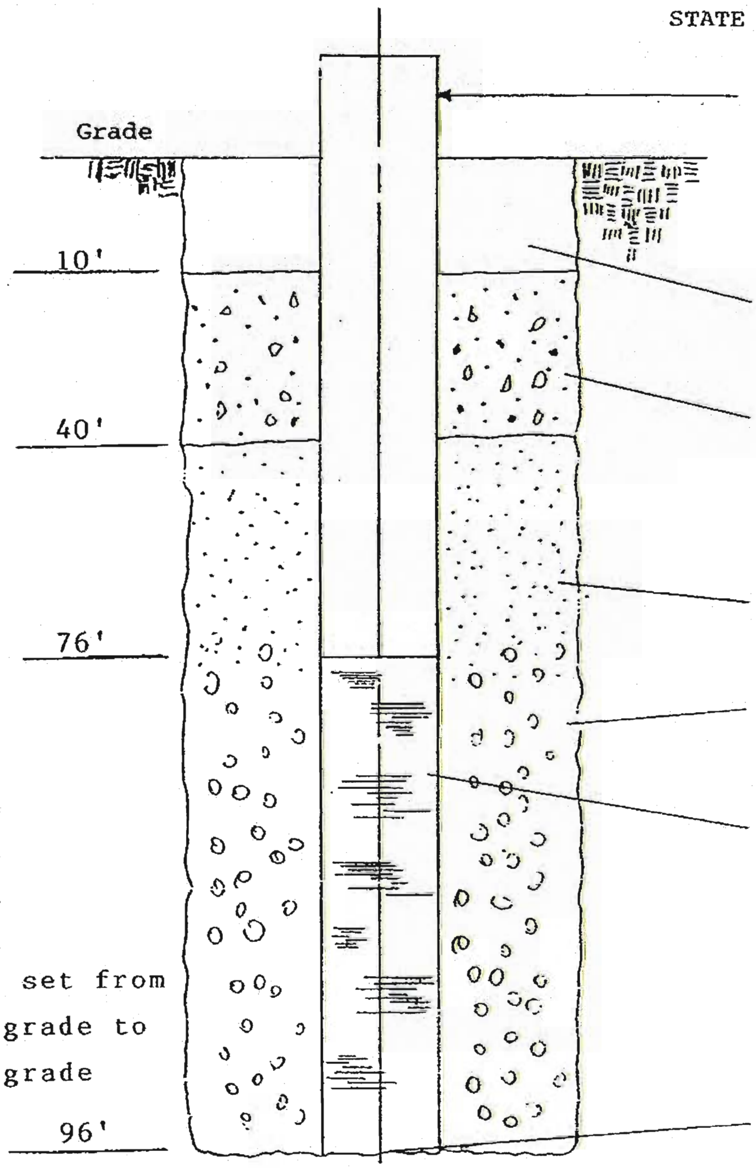
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

JOB NO. 2211-F,
LOCATION 848' north of C.R. 400 W
900' east of C.R. 400 N
TOWER HEIGHT ______
DATE 7/26/02

GRAVEL WALL WELL NO. Welborn
CUSTOMER City of Anderson
COUNTY Madison
TOWNSHIP Lafayette
SECTION 21T20NR7E
STATE Indiana



16" Steel Casing
.375" Wall Thickness
2' Above Grade

Backfill Material

Bentonite chip
30 ' ~~Concrete~~ Seal from
10 ' to 40 '

Formation Stabilizer 40'-66'

30 ' of Silica Gravel
Size #120 American Materials

20 ' of Screen Johnson
Hi-Q stainless steelwire wound
.120" Slot

S. S. Bottom Plate

Pipe Lengths
21'
21'
21'
15'

48" casing set from
37' below grade to
2' above grade

FILL USED FROM BOTTOM UP

#120	Silica Gravel	66' to 96'
	Formation Stabilizer	40' to 76'
	Bentonite chip ~~Concrete~~ Seal	10' to 40'

Specific Capacity 50.6 Static Level 24.6'

Drawdown 22.9 Pumped 1160 GPM at a 47.5' pumping level for 8 hours

Driller Delford Dunn, Jim Parsley
Chuck Million

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, IN 46131
(317) 738-4577
FAX: (317) 738-9295

BASTIN LOGAN WATER SERVICES INC.

Pump Installation Report

City of Anderson - Wellborn Well

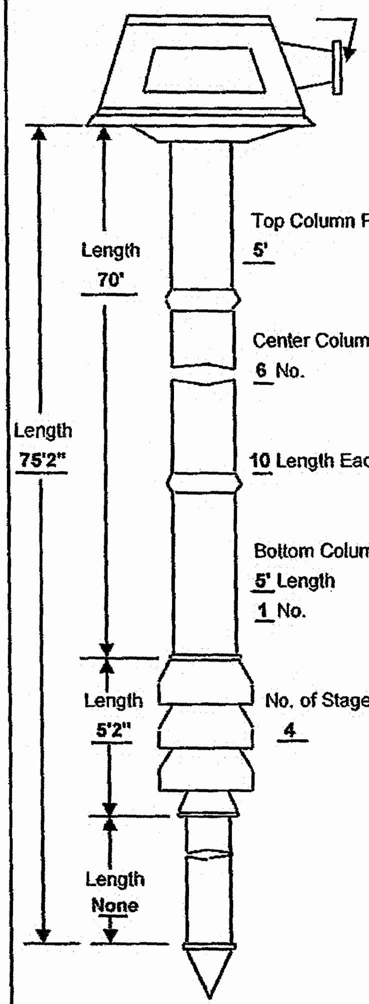
Date:	8/6/09	City, State	Anderson, In
Project No.	3214-F	Pulling Equipment	Hydro
Well Pump Loc.	Wellborn	Over Head Power Lines	Yes

Electric Motor Information

Manufacturer	US	Type	RU	Motor Shaft Threads		Frame	404TP	S/N	D-1201061904
Motor. Shaft Dia.	1 1/2"	Mtr. Shaft. Lgt.	81" cont.	Right Hand	X	Service Factor	1.15	HP	100
Keyway	3/8"	Clutch Diameter	1 1/2"	Left Hand		Volts	230/460	Phase	3
RPM	1780	Upper Bearing	7222-BEM	T.P.I.	12	FL Amps	237/118	Motor Repair	No
Ratcheting	Yes	Lower Bearing	6212-J			Line Voltage	460	SRC	No
CD of Motor	37'								

Pump Assembly Specifics

Discharge Size



Right Angle Drive Information

Brand Name	Amarillo	S/N	241498	Gear Ratio	1-1		
Aux Eng Brand Name	GM	Mod. No.	5.7L V8	S/N	5.7L - 7018		

Pump Information

Pump Head

Pump Head Mfr.	L & B		
Discharge Head Type	T302		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	X	Threaded
Base Plate	Yes		
Pum,p Top Shaft Lgt.	61 1/2"		
Diameter	1 1/2"		
Pin Sz. At Hd.	1 1/2"		
Serial No	1860-09C		

Column Pipe

Coupling	C.I.	X
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	10"H.W.	
Flanged		
Special Paint		

Shaft 1 1/2" S.S. sleeved
10 Thread
.500" Heavy wall pipe installed

Bowl Assembly

Design GPM	1,400	@ TDH	230'
Bowl Assembly Type	SJ12M 4 stage		
Shell Diameter	12"		
Shell Meterial	C.I.	X	BZ.
Impeller Shaft Diameter	N/A		
Shaft Length	N/A		
Bowl Shaft Mat.	S.S.	X	Diam

Suction Pipe

Suction Size	None	Threads On Btm.	None
Length	None	Special Paint	None

Flow Test

SWL	28'	Op. Pressure	80#
GPM	1344	PL	60'
D.D.	32'	Spec. Cap.	41.9
Amps	114-121-120	TDH	245'

Minimium Submergence Above The Eye Of The Bottom Of Impeller

Well Data

Depth	95'6"	Type Well	GWW	X	Screen Diameter	16"
Inside Dia.	15"		Tube		Screen Length	20'
Tower Height	None	Airline mat'ls	None		Screen Open Size	.120"

Misc. Data

Motor.gear drive shaft is 8 thread in head
8X10 thread shaft coupling is used in head

Pump Repaired Last	3/18/2009
Well Repaired Last	
Pump Off Size	

Installer:
Greg Procell
John Mayer, Jr.

Casing extends 2 feet above ground level.

Job No. C-21323

Location from Street or Road

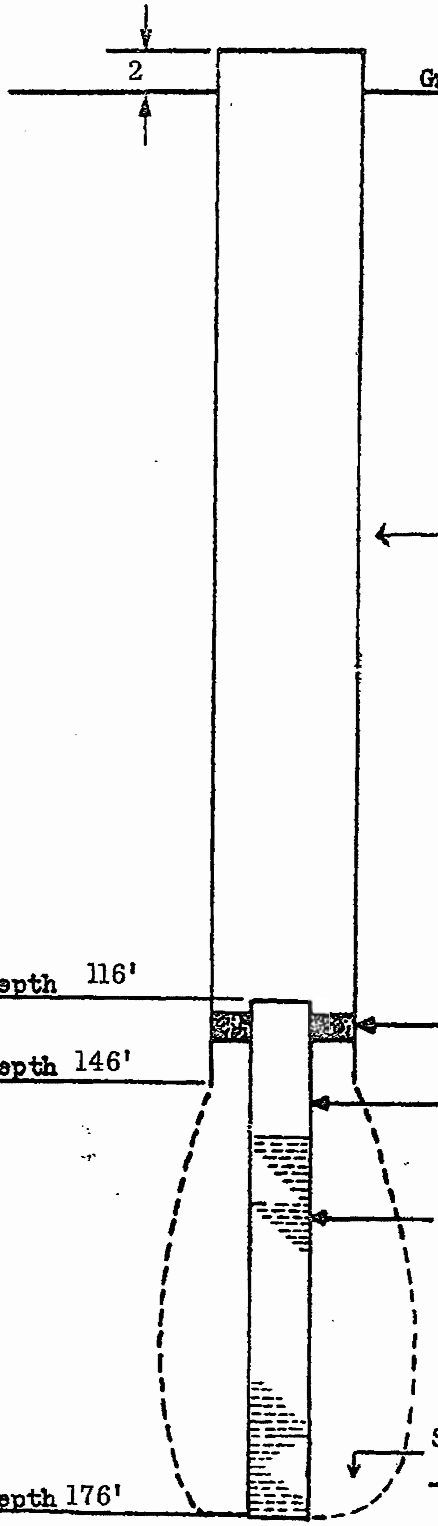
200' S. of Florida St.

200' W. of Rd. 300 W

County Madison

Township Lafayette

Section 27, T20N, R7E



2

Ground Level

42" O.D. Casing

Depth 116'

Concrete Seal

Depth 146'

30' of 30" Blank Pipe

30 ft. of S.S.

LAYNE Shutter Screen 30" Dia.

Opening #5

Silica Gravel Wall

50 yds. #36

Depth 176'

SRAKENGAST PROPERTY

Single Cased

LAYNE GRAVEL WALL WELL No. 3

For

CITY OF ANDERSON

ANDERSON, INDIANA

Driller Ewing F. Allen

Date Finished July 3, 1968

Not drawn to Scale

All depths measured from ground level

Static Level 26'

Pumped 2,409 GPM

at 94' Pumping Level

LAYNE NORTHERN CO. INC.

MISHAWAKA, INDIANA

DRAWN BY

APPROVED BY

DATE

DRAWING NO.

EXHIBIT REC-1

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, IN 46131
(317) 738-4577
FAX: (317) 738-9295

Pump Installation Report

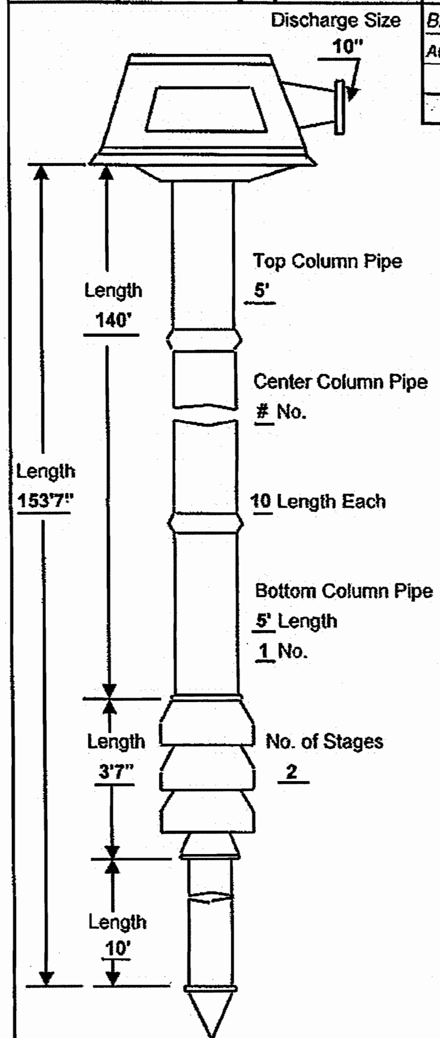
City of Anderson - Schrackengast Well

Date:	7/20/10	City, State	Anderson, Indiana
Project No.	3214-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Schrackengast	Over Head Power Lines	No

Electric Motor Information

Manufacturer	US	Type	RU	Motor Shaft Threads		Frame	A405UP	S/N	R-1993-01-169/R-1012630
Motor. Shaft Dia.	1 3/16"	Mtr. Shaft. Lgt.	72"	Right Hand		ServiceFactor	1.15	HP	75
Keyway	1/4"	Clutch Diameter	1 3/16"	Left Hand	X	Volts	220/440	Phase	3
RPM	1780	Upper Bearing	1-7220M	T.P.I.	8	FL Amps	134/92	Motor Repair	Yes
Ratcheting	Yes	Lower Bearing	1-6212J			Line Voltage	460	SRC	No
CD of Motor	34"								

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	Johnson Gear	S/N	43297	Gear Ratio	1-1
Aux Eng Brand Name		Mod. No.		S/N	
BHP 90 @ 1760 RPM					

Pump Information

Pump Head

Pump Head Mfr.	L & B		
Discharge Head Type	TF1018		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	Threaded	X
Base Plate	Yes		
Pump Top Shaft Lgt.	62"		
Diameter	1 3/16"		
Pin Sz. At Hd.	1 3/16"		
Pump Brand	Simmons Bowls		

Column Pipe

Coupling	C.I.	X
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	10"	
Screwed		X
Water Lube		X
Shaft Size	1 31/6"	

Bowl Assembly

Design GPM	1,400	@ TDH	160'	
Bowl Assembly Type	Simmons			
Shell Diameter	12"			
Shell Meterial	C.I.	X	BZ.	
Stickup	12 1/2"			
Serial No.	Model#SJ12HT/2881-06D			
Bowl Shaft Mat.	S.S.	X	Diam	

Suction Pipe

Suction Size	8"	Threads On Btm.	Yes
Length	10'	Special Paint	

Flow Test

SWL	38'	Op. Pressure	25#
GPM	781	PL	101'
D.D.	63'	Spec. Cap.	12.3
Amps	71-72-69	TDH	159'

Minimium Submergence Above The Eye Of The Bottom Of Impeller

Well Data

Depth	173'	Type Well	GWW	X	Screen Diameter	24"P.S.
Inside Dia.	22"(24"OD)		Tube		Screen Length	30'
Tower Height	Bldg.	Airline mat'ls			Screen Open Size	.105"

Misc. Data

Pump Repaired Last	6-09
Well Repaired Last	
Pump Off Size	4" - 4x6 90°needed

Installer: John Britton
John Mayer, Jr.
Andy Patton
Kevin Ruert

Job No. C-21323

Location from Street or Road

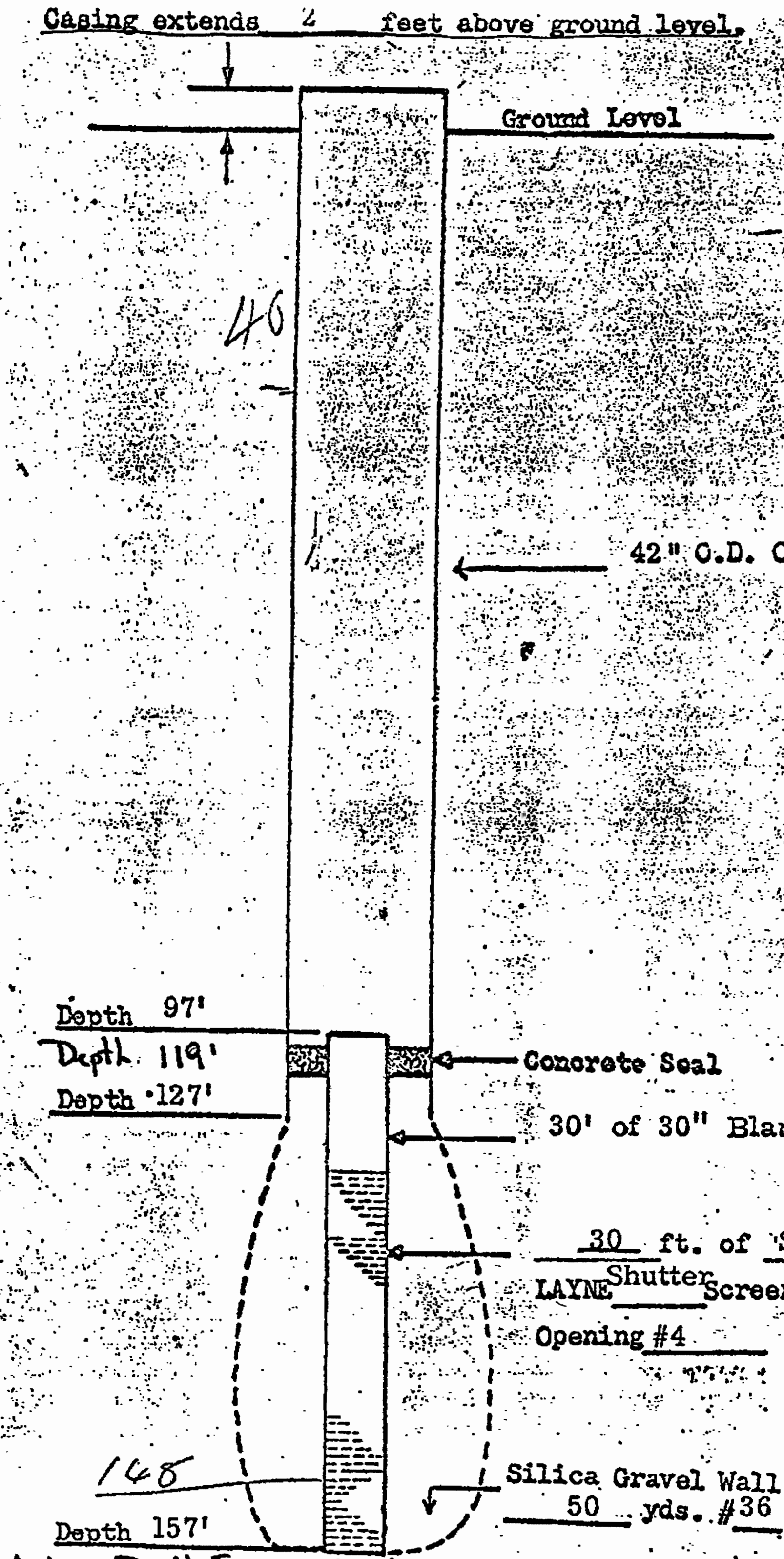
200' S. of Road 300N.

200' E. of West Fence Line

County Madison

Township Lafayette

Section 34, T20N, R7E



127' 42" Casing Depth
− 119' 30" Screen Top Depth
8' 30" Screen IN 42" Casing not exposed.

149' Total Depth
− 30' Screen Length
119' Top of Screen

Actual Depth From Grade is 149'.

TUCKER PROPERTY

Single Cased
LAYNE GRAVEL WALL WELL No. 4
For
CITY OF ANDERSON
ANDERSON, INDIANA

Driller Ewing F. Allen

Date Finished July 14, 1969

Not drawn to Scale
All depths measured from ground level

Static Level 24'
Pumped 2,435 GPM
at 68' Pumping Level

LAYNE NORTHERN CO. INC.
MISHAWAKA, INDIANA

DRAWN BY APPROVED BY DATE	DRAWING NO.

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Pump Installation Report

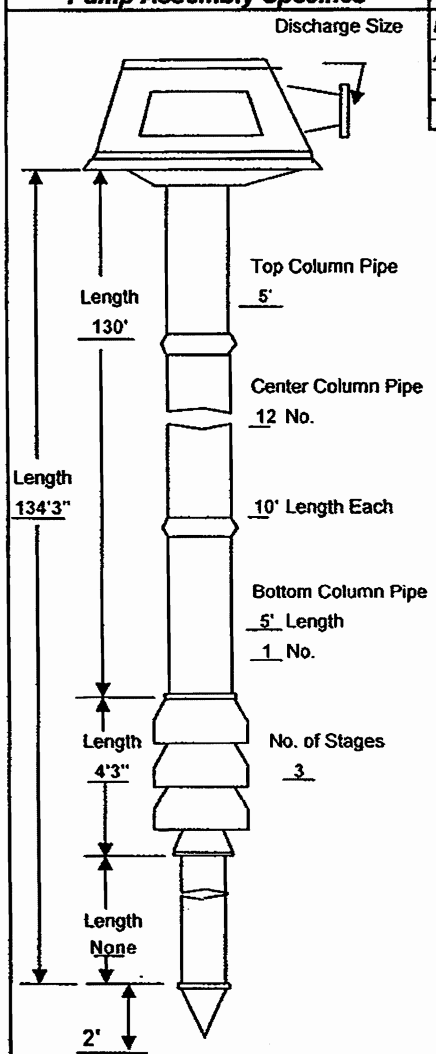
City of Anderson Tucker Well

Date:	9/19/05	City, State	Anderson, Indiana
Project No.	2646-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Tucker Well	Over Head Power Lines	Yes

Electric Motor Information

Manufacturer	US	Type	RU	Motor Shaft Threads		Frame	A405JP	S/N	R1010953		
Motor. Shaft Dia.	1 3/16"	Mtr. Shaft. Lgt.	36 1/4"	Right Hand		ServiceFactor		HP	75		
Keyway	1/4"	Clutch Diameter	1 3/16"	Left Hand		Volts	220/440	Phase	3		
RPM	1780	Upper Bearing	1-7222M	T.P.I.		Amps	139/92	Motor Repair		No	
Ratcheting		Lower Bearing	62120			Line Voltage	440	SRC		No	
CD of Motor	33 1/4"										

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	Johnson	S/N	43296	Gear Ratio	1:1
Aux Eng Brand Name	Red Seal	Model	B427	S/N	12884

Pump Information

Pump Head

Pump Head Mfr.				
Discharge Head Type	TF1018			
Discharge Line Size	10"			
Location	Above	X	Grade	
	Below			
ColumnTo Head	FLGD	X	Threaded	
Base Plate	Yes			
Pump Top Shaft Lgt.	62"			
Diameter	1 3/16"			
Pin Sz. At Hd.	1 3/16"			

Column Pipe

Coupling	C.I.	
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	10"	
Flanged		No
Special Paint		No
Shaft size 1 3/16" SS		

Bowl Assembly

Design GPM	1400	@ TDH	165'	
Bowl Assembly Type	SJ12M			
Shell Diameter	12"			
Shell Material	C.I.	X	BZ.	
Impeller Shaft Diameter	NA			
Shaft Length	NA			
Bowl Shaft Mat.	S.S.	X		

Note: New bowls, column pipe and couplings

Suction Pipe

Suction Size	None	Threads On Btm.	
Length		Special Paint	

Flow Test

SWL	39'	Op. Pressure	40#
GPM	1001	PL	112'
D.D.	72'	Spec. Cap.	13.7
Amps	76-81-77		

Well Data

Depth	151'9"	Type Well	GWW	X	Screen Diameter	
Inside Dia.	24"		Tube		Screen Length	
Tower Height					Screen Open Size	

Misc. Data

Installers:
Greg Procell, Bill Claytor
John Mayer & Kraig Cummings

Bowls Repaired	1999
Well Repaired Last	2002
Pump Off Size	

Casing extends ______ feet above ground level.

Job No. C-21323

Location from Street or Road

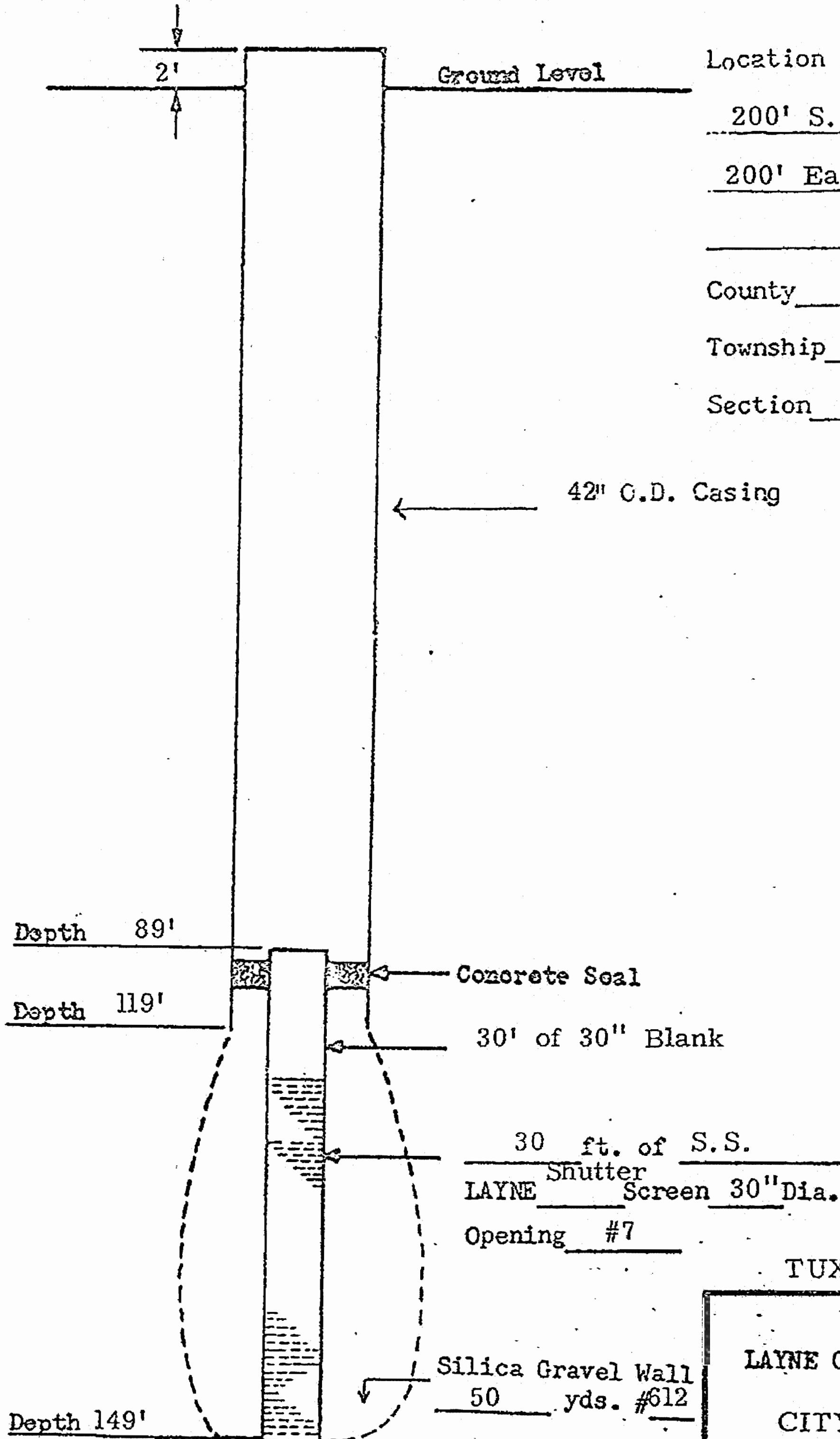
200' S. of Road 700 N,

200' East of jog in road

County Madison

Township Richland

Section 7, T20N, R7E



TUXFORD PROPERTY

Single Cased
LAYNE GRAVEL WALL WELL No. 5
For
CITY OF ANDERSON
ANDERSON, INDIANA

Driller Ewing Allen & H. D. Hall

Date Finished September 5, 1968

Not drawn to Scale
All depths measured
from ground level

Static Level 34'
Pumped 1,016 GPM
at 64' Pumping Level

LAYNE NORTHERN CO. INC.
MISHAWAKA, INDIANA

DRAWN BY APPROVED BY DATE	DRAWING NO.

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, IN 46131
(317) 738-4577
FAX: (317) 738-9295

Pump Installation Report

City of Anderson - Tuxford Well

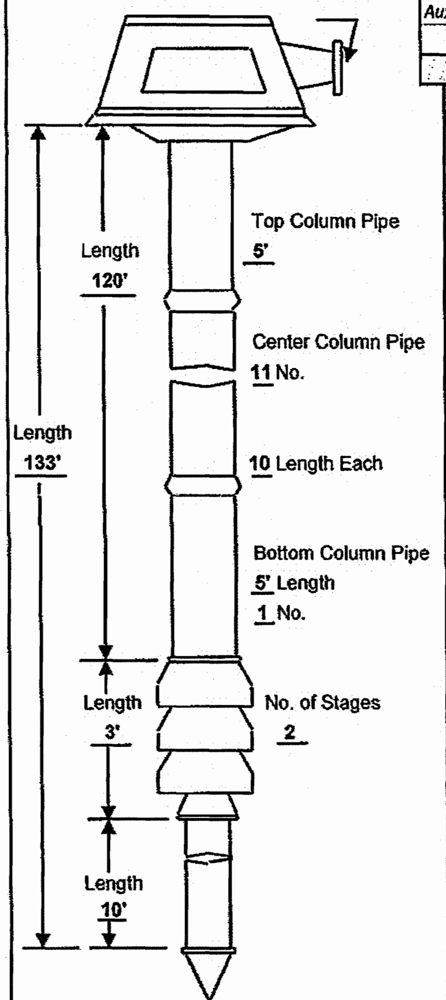
Date:	2/7/11	City, State	Anderson, Indiana
Project No.	3371-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Tuxford	Over Head Power Lines	Yes

Electric Motor Information

Manufacturer	US	Type	AUI	Motor Shaft Threads		Frame	286 TPH	S/N	802-307213146T-01
Motor. Shaft Dia.	1 3/16"	Mtr. Shaft. Lgt.	32"	Right Hand		ServiceFactor	1.15	HP	30
Keyway	1/4"	Clutch Diameter	1 3/16"	Left Hand	X	Volts	230/460	Phase	3
RPM	1770	Upper Bearing	6210 2ZJ	T.P.I.	10	FL Amps	72/36	Motor Repair	New
Ratcheting	Yes	Lower Bearing	7310 BEP			Line Voltage	460	SRC	No
CD of Motor	24 1/2"								

Pump Assembly Specifics

Discharge Size



Weight 7400#

Right Angle Drive Information

Brand Name		S/N		Gear Ratio	
Aux Eng Brand Name		Mod. No.		S/N	

Pump Information

Pump Head

Pump Head Mfr.	L & B		
Discharge Head Type	TF1018		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	X	Threaded
Base Plate	Yes		
Pump Top Shaft Lgt.	62".		
Diameter	1 3/16"		
Pin Sz. At Hd.	1 3/16"		
Pump Brand	Simmons		

Column Pipe

Coupling	C.I.	X
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	8"	
Screwed		X
Water Lube		X
Shaft Size	1 3/16"	
8 thread shafting		

Bowl Assembly

Design GPM	800	@ TDH	120'	
Bowl Assembly Type	SL12MT			
Shell Diameter	12"			
Shell Meterial	C.I.	X	BZ.	
Stick up	12"			
Serial No.	1137-11A			
Bowl Shaft Mat.	S.S.	X	Diam	1 11/16"

Suction Pipe

Suction Size	8"	Threads On Btm.	No
Length	10'	Special Paint	

Flow Test

SWL	33'	Op. Pressure	20#
GPM	800	PL	80'
D.D.	47'	Spec. Cap.	17
Amps	36-35-38	TDH	120'

Minimium Submergence Above The Eye Of The Bottom Of Impeller

Well Data

Depth	146'	Type Well	GWW	X	Screen Diameter	16"
Inside Dia.	15 3/8"		Tube		Screen Length	30'
Tower Height	None	Airline mat'ls	None		Screen Open Size	.055"

Misc. Data

Installer:

Greg Procell

Pump Repaired Last	2002
Well Repaired Last	2010
Pump Off Size	6"

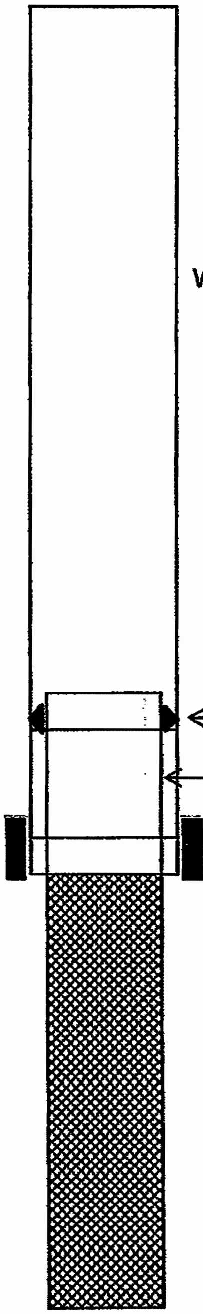
BASTIN LOGAN WATER SERVICES INC.

237 W. Monroe St.
P.O. Box 55
Franklin, IN 46131
(317) 738-4577
Fax: (317) 738-9295

Tubular Well Print

City of Anderson - Gahimer Well (Replacement Well)

Tower Height	N/A	
Pipe Extends	2'-0":	feet above ground level



Pipe Size 24"
Wall Thickness .500"

Depth 101'
K-packer expanded against pipe
Blank Tube
Size
Length
Depth 103'
Steel Drive Shoe

Well Screen
Type Johnson SSWW-Hi-Q
Slot Size .050

Depth 132'

Customer Information		
Job #	3373-F	
Customer:		
City of Anderson		
Well No.	Gahimer	
Customer Location		
Location from street or road:		
Approx. 100' east of existing Gahimer Well. Approx. 1000' from St. Rd. 9between CR 500 & CR 600.		
UTM 16T	612747	
UTM	4449357	
County	Madison	
Township	2N	
Section	13	
Range	7E	
State	Indiana	
Civil Twsp	Lafayette	
Well Data		
Static Water Level	44.65	
Pumped	1056	GPM at
78.47	Pumping Level	
After	24	Hours
Drawdown	33.82	
Specific Capacity	31.22	
Drillers:		
Jim Parsley		
Date completed	2/2/2011	

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Pump Installation Report

City of Anderson - Gahimer Well # 6

Date:	March 27,2006	City Anderson	Indiana
Project No.	2646F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Gahimer	Over Head Power Lines	Yes

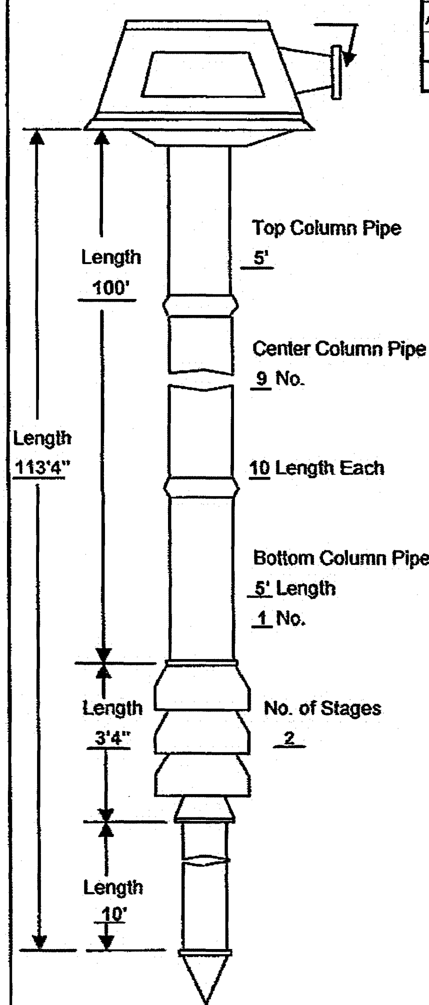
Electric Motor Information

Manufacturer	US	Type	RU	Motor Shaft Threads		Frame	A326UPY	S/N	R-2013257
Motor. Shaft Dia.	1 3/16"	Mtr. Shaft. Lgt.	33"	Right Hand		ServiceFactor	1.15	HP	30
Keyway	1/4"	Clutch Diameter	1 3/16"	Left Hand	x	Volts	220/450	Phase	3
RPM	1760	Upper Bearing	I-7213BY	T.P.I.	8	FL Amps	76/38	Motor Repair	yes by client
Ratcheting	NRR	Lower Bearing	I-62100			Line Voltage	460	SRC	no
CD of Motor	27"								

Recmd. Lat .Set.		Min. Setting		Max. Setting	

Pump Assembly Specifics

Discharge Size



Right Angle Drive Information

Brand Name		S/N		Gear Ratio	
Aux Eng Brand Name		Mod. No.		S/N	

Pump Information

Pump Head

Pump Head Mfr.	L & B		
Discharge Head Type	T302		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	X	Threaded
Base Plate	yes		
Pump Top Shaft Lgt.	62"		
Diameter	1 3/16"		
Pin Sz. At Hd.	1 3/16"		

Column Pipe

Coupling	C.I.	x
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	10"	
Flanged		No
Special Paint		X

Shaft size 1 3/16"
8 thd. L.H.

Bowl Assembly-Simmons

Design GPM	800	@ TDH	136	
Bowl Assembly Type	SJ12m-2 stages			
Shell Diameter	12"			
Shell Meterial	C.I.	X	BZ.	
Impeller Shaft Diameter	1 11/16"			
Shaft Length	51 3/4"			
Bowl Shaft Mat.	S.S.	X	Diam	1 3/16" pin

Suction Pipe

Suction Size	8" steel	Threads On Btm.	none
Length	10'	Special Paint	no

Flow Test

SWL	42'	Op. Pressure	20#
GPM	770	PL	68
D.D.	26'	Spec. Cap.	29.8
Amps	36-41-37		

Minimium Submergence Above The Eye Of The Bottom Of Impeller	

Well Data-Lined March 2000

Depth	129'4"	Type Well	G.W.W.	X	Screen Diameter	18"
Inside Dia.	17 1/8"		Tube		Screen Length	30'
Tower Height					Screen Open Size	.060"

Misc. Data

Note: 18" liner installed and gravel packed in 2000

Installer: Greg Procell, John Mayer, Kraig Cummings

Pump repaired	2006
Well Repaired Last	2006
Pump Off Size	6"

EXHIBIT REC-1

Casing extends 2 feet above ground level.

Job No. C-21323

Location from Street or Road

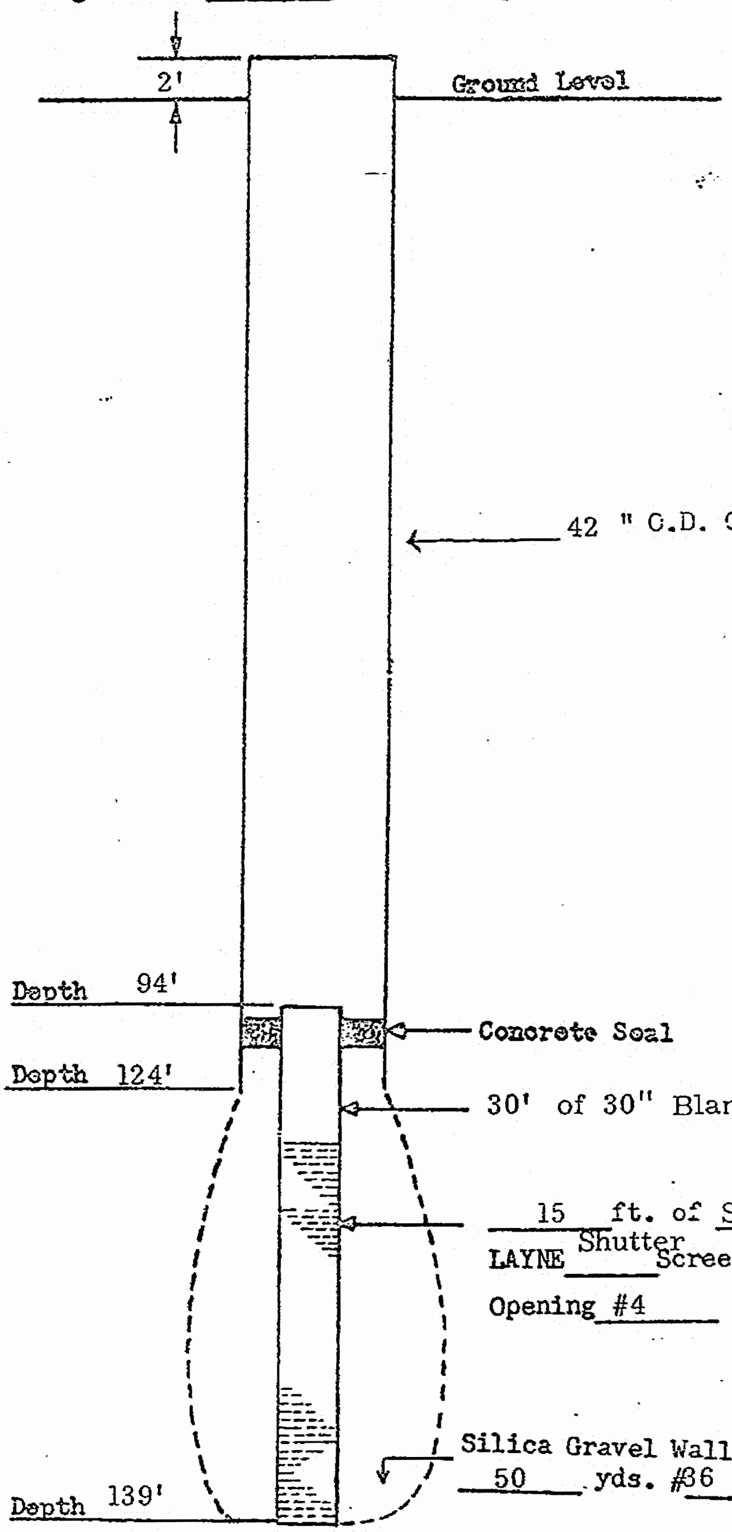
200' E. of 100 W. &

135' S. of North Fence

County Madison

Township Lafayette

Section 13, T20N, R7E



JARRETT PROPERTY

Single Cased
LAYNE GRAVEL WALL WELL No. 7
For
CITY OF ANDERSON
ANDERSON, INDIANA

Driller Hoyt Foster

Date Finished December 20, 1968

Not drawn to Scale
All depths measured
from ground level

Static Level 9'
Pumped 1000 GPM
at 63' Pumping Level

LAYNE NORTHERN CO. INC.
MISHAWAKA, INDIANA

DRAWN BY
APPROVED BY
DATE

DRAWING NO.

EXHIBIT REC-1

Layne NORTHERN COMPANY, INC.

INDIANAPOLIS • MISHAWAKA • LANSING

PUMP INSTALLATION REPORT

File No. P#59978

Sales Order No. C-21324 Date 10-8-69

Pump Mfg. Layne & Bowler Serial No. 59978 Well No. (7)

Owner CITY OF ANDERSON City Anderson State Indiana

Location of Well JARRETT-200' E. of 100W & 135' S. of North Fence

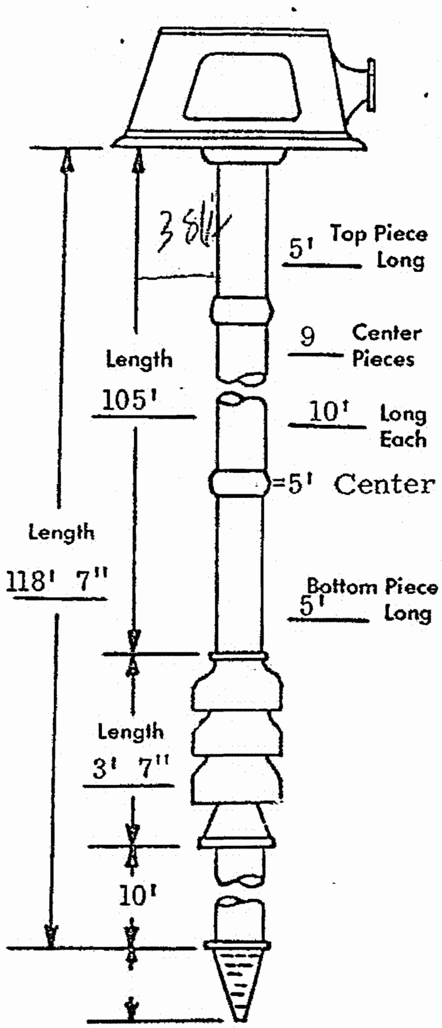
MOTOR: Make U.S. Type RU Frame A326UP Ser. No. R-2013278

HP 30 Volts 220/440 Line Voltage 76/38 Phase 3 RPM 1760

Was Motor Taken to a repair shop at this time? ______ Where? ______

GEAR DRIVE: Make ______ Serial No. ______ Gear Ratio ______

ENGINE: Make ______ Model ______ Serial No. ______



PUMP HEAD Type TF1018

Discharge Pipe Size 10"

Located Above above/below ground

Flanged x Threaded ______

Separate Base Plate? Yes

Head Shaft Length 5' 2"

Dia. 1 3/16" Coupled above x below ______

MOTOR SHAFT: Dia. 1 3/16" Length *
*2' 8 1/2"

Thread Size in Head ______ Keyway ______

PUMP BOWL Type RKAL

Dia. 12" No. of Stages 2

Bowls - Cast Iron or Bronze? ______

Shaft - SS x CS ______ Length ______

COLUMN Pipe Size 10"

Flanged ______ Coupled x

Special Paint? Coated

Oil Lube ______ Water Lube x

Shaft Size 1 3/16" SS x or CS ______

Tubing Size ______ Stl ______ or Br ______

SUCTION PIPE Size 8"

Length 10' Special Paint? Coated

Threads on Bottom? Yes

Strainer ______ Size ______

~~Rubber Bumper?~~ ______

~~Well Seal?~~ ______

NOTE — All measurements from top of pump foundation.

WELL INFORMATION

Inside Dia. 42" Depth 141' Static 28' 8" Type: Gravel Wall - ~~Tubular~~ ~~Rock~~ G. W.

Air Line Length 105 Ft. Strapped to Column? No

Type Airline ______ Plastic x. Copper Tubing ______ Steel Pipe ______

PUMPING TEST - Pumped ______ GPM at ______ Ft. Pumping Level ______

with ______ lbs. discharge pressure after ______ hours. ______

Pump to Waste Outside ______ Inside ______ Size ______ THD.O. ______

PULLING INSTRUCTIONS

Length of Poles required 30' Special equipment or pulling

instructions ______

Power Lines: ______

REMARKS: ______

Eugene Smith

Casing extends 3 feet above ground level.

Job No. C-21323

Location from Street or Road

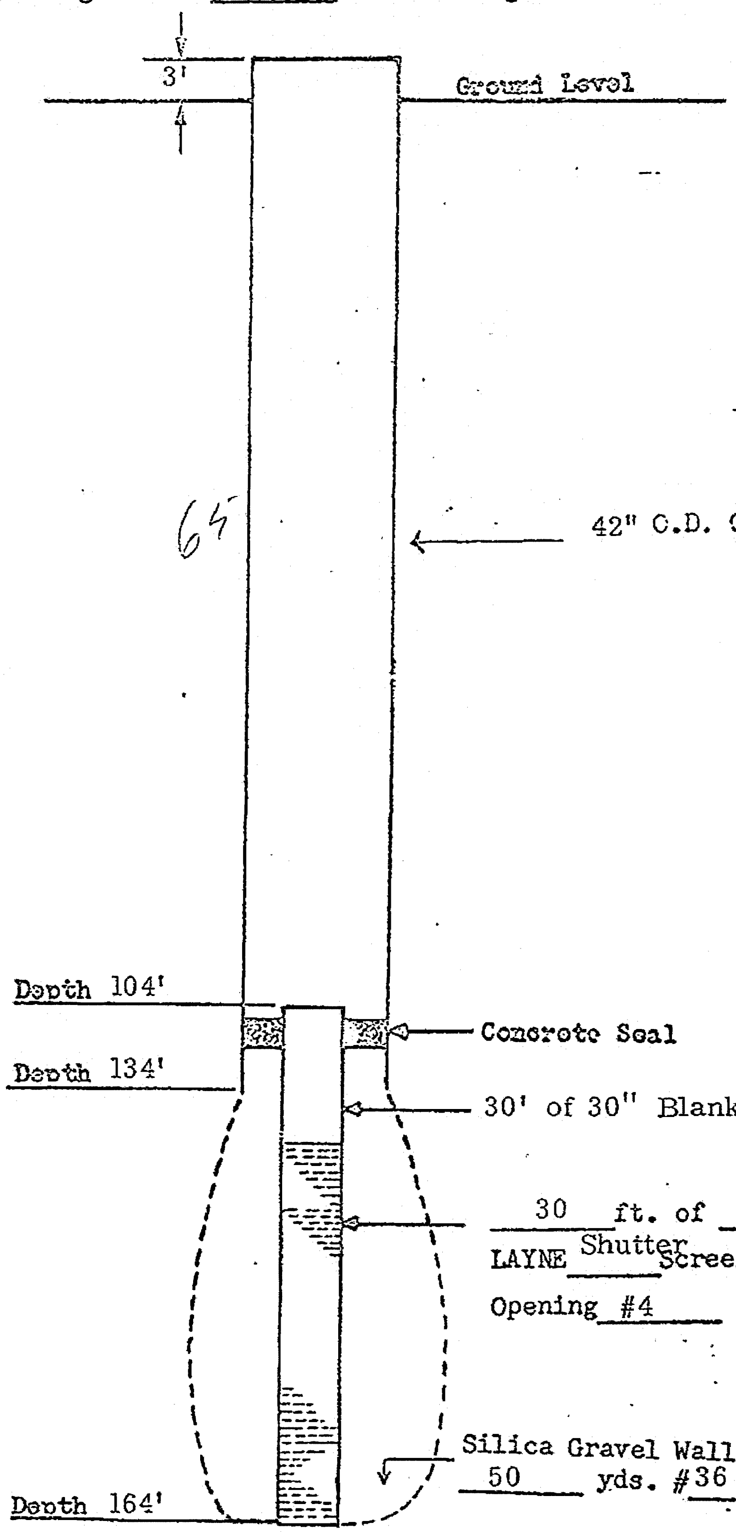
200' W. of Rd. 150 W.,

2440' S. of Road 500 N

County Madison

Township Lafayette

Section 23, T20N, R7E



ROCK. PROPERTY

Single Cased
LAYNE GRAVEL WALL WELL No. 8
For
CITY OF ANDERSON
ANDERSON, INDIANA

Driller Ewing F. Allen

Date Finished August 14, 1969

Not drawn to Scale
All depths measured
from ground level

Static Level 21'
Pumped 1,440 GPM
at 39' Pumping Level

LAYNE NORTHERN CO. INC.
MISHAWAKA, INDIANA

DRAWN BY
APPROVED BY
DATE

DRAWING NO.

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, IN 46131
(317) 738-4577
FAX: (317) 738-9295

Pump Installation Report

City of Anderson - Rock Well

Date:	7/23/09	*City, State*	Anderson, Indiana
Project No.	3214-F	*Pulling Equipment*	Hydro
Well Pump Loc.	Rock Well-CR150W &500N	*Over Head Power Lines*	Yes

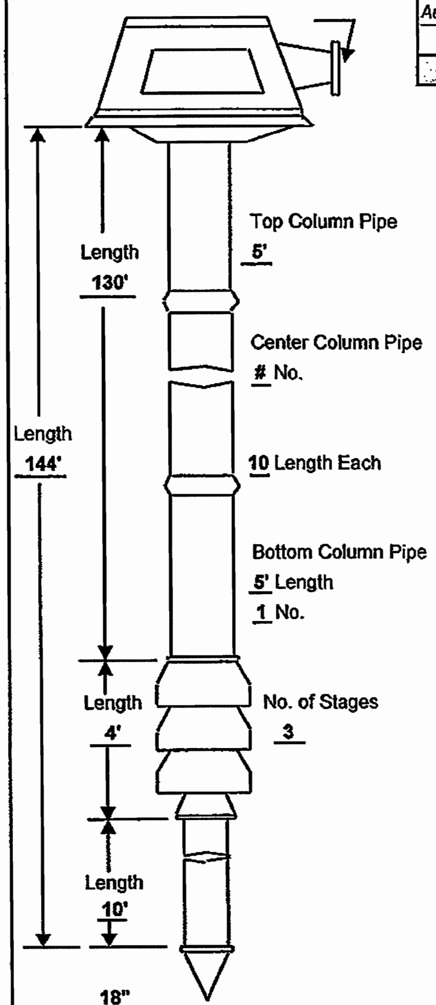
Electric Motor Information

Manufacturer	US	*Type*	RJ	*Motor Shaft Threads*		*Frame*	A405 JP	*S/N*	1998-01-169-1010975
Motor. Shaft Dia.	1 3/16"	*Mtr. Shaft. Lgt.*	39"	*Right Hand*		*Service Factor*	1.15	*HP*	75
Keyway	1/4"	*Clutch Diameter*	1 3/16"	*Left Hand*	X	*Volts*	440	*Phase*	3
RPM	1700	*Upper Bearing*	1-7222M	*T.P.I.*	8	*FL Amps*	92	*Motor Repair*	Yes
Ratcheting	No	*Lower Bearing*	1-C212J			*Line Voltage*	460	*SRC*	Yes
CD of Motor	33"								

Motor repaired by Client

Pump Assembly Specifics

Discharge Size



Right Angle Drive Information

Brand Name		*S/N*		*Gear Ratio*	
Aux Eng Brand Name		*Mod. No.*		*S/N*	

Pump Information

Pump Head

Pump Head Mfr.	L & B
Discharge Head Type	T302
Discharge Line Size	10"
Location	*Above* X Grade
	Below
ColumnTo Head	*FLGD* X *Threaded*
Base Plate	Yes
Pump Top Shaft Lgt.	62"
Diameter	1 3/16"
Pin Sz. At Hd.	1 3/16"
Serial No	3943-09G

Column Pipe

Coupling	*C.I.*	X
	S.T.	
Spiders	*Drop - In*	
	Screw - In	
Col. Pipe Size		8"
Flanged		No
Special Paint		No

Heavy Wall .500"

S.S. Cone Strainer

Bowl Assembly

Design GPM	1,000	*@ TDH*	200'
Bowl Assembly Type	SK12C		
Shell Diameter	12"		
Shell Meterial	*C.I.* X	*BZ.*	
Impeller Shaft Diameter	1 11/16"		
Shaft Length	N/A	1 3/16" 8Thd. Pin	
Bowl Shaft Mat.	*S.S.* X	*Diam*	1 11/16"
Minimium Submergence Above The Eye Of The Bottom Of Impeller			

Suction Pipe

Suction Size	8"	*Threads On Btm.*	No
Length	10'	*Special Paint*	No

Flow Test

SWL	32'	*Op. Pressure*	75#
GPM	844	*PL*	67'
D.D.	45'	*Spec. Cap.*	24.1
Amps	74-76-78	*TDH*	240'

Well Data

Depth	169'	*Type Well*	*GWW* X	*Screen Diameter*	18" liner
Inside Dia.	17"		*Tube*	*Screen Length*	30'
Tower Height		*Airline mat'ls*		*Screen Open Size*	

Misc. Data

18" liner & screen

Installer:

Greg Procell
John Mayer, Jr.

Pump Repaired Last	2002
Well Cleaned Last	2009
Pump Off Size	8"

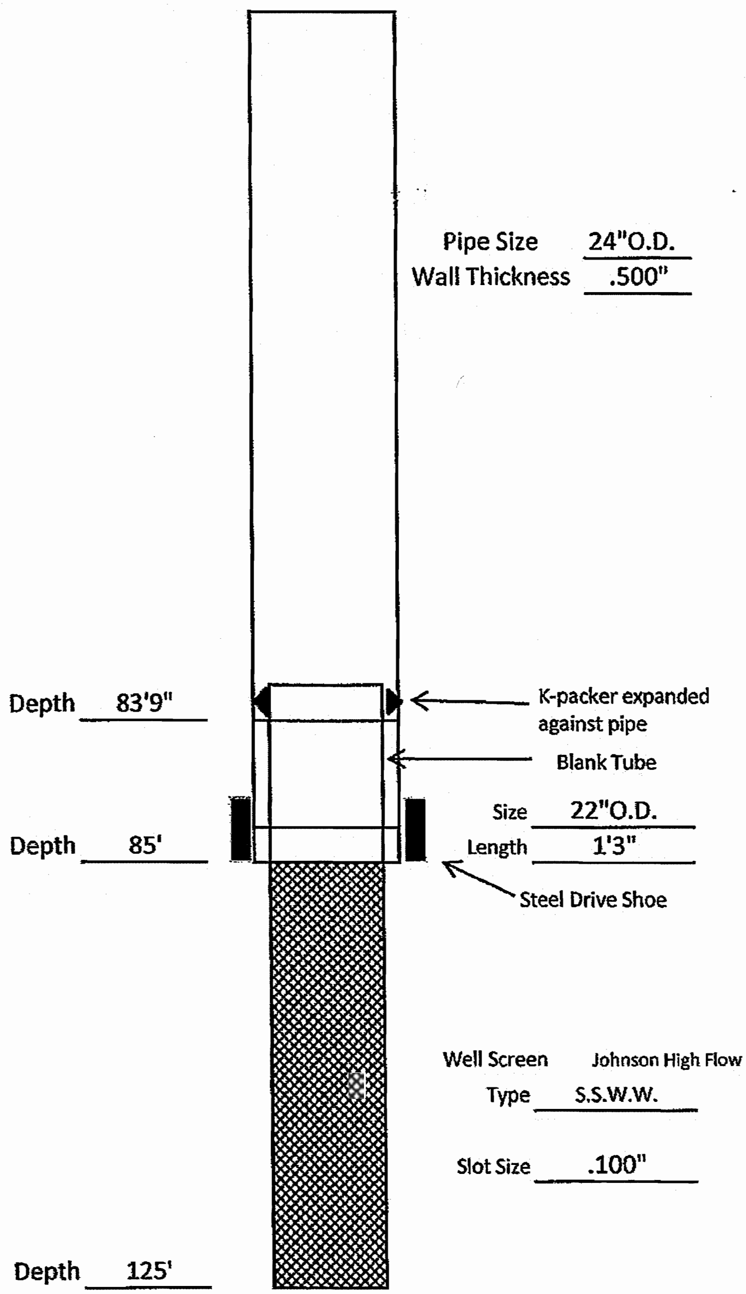
BASTIN LOGAN WATER SERVICES INC.

237 W. Monroe St.
P.O. Box 55
Franklin, IN 46131
(317) 738-4577
Fax: (317) 738-9295

Tubular Well Print

City of Anderson, In

Tower Height		
Pipe Extends		feet above ground level



Customer Information	
Job #	3178-F
Customer:	City of Anderson, In
Well No.	Equestrian Well #1
Customer Location	
Location from street or road:	
324' S of C.R. 300N	
180' E. of W. Property Line	
900' E. of C.R. 400N	
UTM 16T	606199
UTM	4444792
County	Madison
Township	Anderson T20N
Section	29 R7E
State	Indiana

Well Data		
*See Step Test		
Static Water Level		
Pumped		GPM at
	Pumping Level	
After		Hours
Drawdown		
Specific Capacity		

Drillers:
Delford Dunn
License #189

Date completed	12/19/2008

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, IN 46131
(317) 738-4577
FAX: (317) 738-9295

BASTIN LOGAN WATER SERVICES INC.

Pump Installation Report

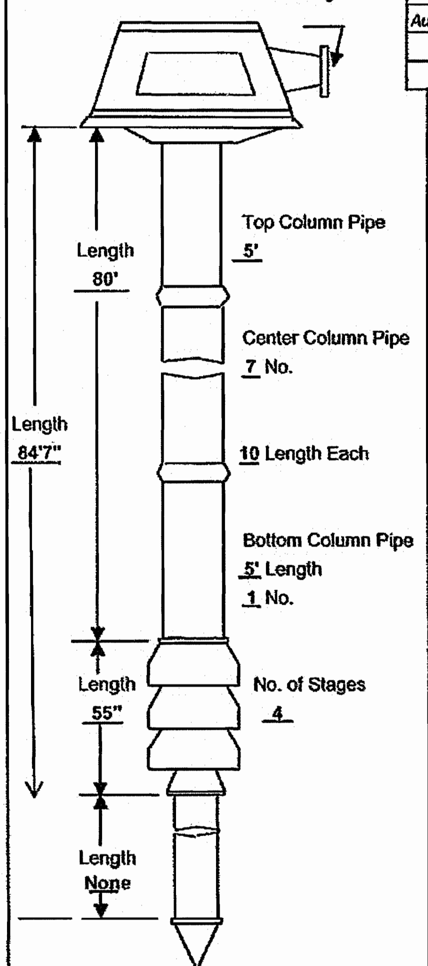
MK Betts - Anderson - Equestrian Well #1

Date:	2/6/09	City, State	Anderson, In
Project No.	3178-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Equestrian Well #1	Over Head Power Lines	No

Electric Motor Information

Manufacturer	US	Type	RUSI	Motor Shaft Threads		Frame	404TP	S/N	P017334875-0028M-0007
Motor. Shaft Dia.	1 1/2"	Mtr. Shaft. Lgt.	44"	Right Hand		ServiceFactor	1.15	HP	100
Keyway	3/8"	Clutch Diameter	1 1/2"	Left Hand	X	Volts	460 PWS	Phase	3
RPM	1785	Upper Bearing	7222 BEM	T.P.I.	12	FL Amps	114	Motor Repair	New
Ratcheting	NRR	Lower Bearing	6212-J			Line Voltage	460	SRC	No
CD of Motor	36 15/16"								

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	None	S/N		Gear Ratio	
Aux Eng Brand Name	None	Mod. No.		S/N	

Pump Information

Pump Head

Pump Head Mfr.	American Marsh		
Discharge Head Type	TRIOC		
Discharge Line Size	10"		
Location Above	X	Grade	
Location Below			
ColumnTo Head FLGD		Threaded	X
Base Plate	Yes		
Pump Top Shaft Lgt.	67"		
Diameter	1 1/2"		
Pin Sz. At Hd.	1 1/2"-12Thd.		
Serial No	164107		

Column Pipe

Coupling	C.I.	
	S.T.	X
Bronze	Drop - In	X
Spiders	Screw - In	
Col. Pipe Size	10"	
Flanged		No
Special Paint		No

Bowl Assembly

Design GPM	1400	@ TDH	230'
Bowl Assembly Type	12 HC 4 stages		
Shell Diameter	12"		
Shell Material	C.I. X	BZ.	
Impeller Shaft Diameter	11/16"x1 1/2" 12 Thd F		
Shaft Length	61 1/8"		
Bowl Shaft Mat.	S.S. X	Diam	1 11/16"

Suction Pipe

Suction Size		Threads On Btm.	
Length		Special Paint	

Flow Test

SWL	44'4"	Op. Pressure	
GPM		PL	
D.D.		Spec. Cap.	
Amps		TDH	

Minimum Submergence Above The Eye Of The Bottom Of Impeller	.26"

Well Data

Depth	128'4"	Type Well	GWW	Screen Diameter	22"O.D.
Inside Dia.	23"		Tube X	Screen Length	40'
Tower Height		Airline mat'ls		Screen Open Size	.100"

Misc. Data

Installer: John Britton
Tim Thompson
Andy Patton

Pump Repaired Last	New
Well Repaired Last	New
Pump Off Size	10"

Appendix C:

Estimated Sources and Uses of Funds

July 12, 2013

Prepared by Crowe Horwath

ANDERSON MUNICIPAL WATER UTILITY
Anderson, Indiana

Proposed Waterworks Revenue Bonds of 2014
Estimated Sources and Uses of Funds

Sources of Funds:	
Par Amount of Bonds	$ 14,330,000
Total Sources of Funds	$ 14,330,000
Uses of Funds:	
Lafayette Well Field Improvements (1)	$ 1,672,500
New Lafayette Water Treatment Plant (1)	8,171,000
Wheeler Bypass Piping and Partial Demolition (1)	594,000
Water Distribution System Replacement - Homewood (1)	1,544,622
Hydrogeological Study for New Well Field (1)	460,000
Engineering Study for Phase II Alternatives (1)	100,000
Hydraulic Model of Distribution System (1)	200,000
Preliminary Engineering Report (1)	50,000
Debt Service Reserve Fund	1,170,036
Indiana Utility Regulatory Commission Fee	35,825
Underwriter's Discount (1%)	143,300
Bond Counsel (Estimated)	40,000
Regulatory Counsel (Estimated)	50,000
Financial Advisor (Estimated)	38,000
Rate Consultant (Estimated)	40,000
Rating Agency (Estimated)	18,000
Registrar and Paying Agent	1,000
I-Preo Electronic Sale	1,000
Miscellaneous Expenses	717
Total Uses of Funds	$ 14,330,000

(1) Estimates provided by Curry & Associates, Inc.

Appendix D:

Preliminary Budget Estimate for Groundwater Exploration along

White River, near Anderson, Indiana

April 25, 2014

Prepared by Layne

EXHIBIT REC-1

EXHIBIT REC-1

WATER · MINERAL · ENERGY

April 25, 2014

Lori A. Young, P.E.
Curry & Associates, Inc.
110 Commerce Drive
Danville, Indiana 46122

RE: Preliminary budget estimate for groundwater exploration along White River, near Anderson, Indiana

Dear Lori:

As requested, here is a very preliminary estimate based on assumptions about the scope of the exploration and testing program, and scaling of previous costs for similar programs. This estimate is for testing in one area, and assumes that each step is encouraging and leads to proceeding with the next. If at any step of the process the results were unfavorable, the program would stop in that area. In order to find the desired quantity of water, it may be necessary to explore and test more than one area. The quantities of test borings, depths will obviously vary depending on the location and size of the property available to investigate. The assumptions for this estimate are:

- Six (6) exploratory borings, single mobilization of sonic drill rig for all test borings, 150 ft depth, logging, sieve analysis
- Three (3) of the exploratory borings completed as 2-inch temporary monitoring wells for aquifer testing
- Geophysical survey (seismic and resistivity) prior to test well siting and construction
- 12-inch diameter temporary test well designed, constructed and developed
- Step test and 72-hour extended period test, instruments in MW's, river and riverbed
- Abandon MW's and test well, if appropriate
- Water quality sampling and analysis
- Aquifer test analysis
- Groundwater model development and calibration, based on test boring data, geophysics, aquifer test
- Preliminary well field design (locations, spacing, yield)
- Report

EXHIBIT REC-1

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For budgeting, the likely range of costs for completing the above program in one area is as follows:

Test borings and monitoring wells	$65-75,000
Geophysical survey	$20-25,000
Test well construction and aquifer test	$85-95,000
Analysis, groundwater modeling, prelim well field design	$30-35,000
Report	$20-25,000
Total	$220-255,000

The costs will of course vary depending on the number and depth of borings. The cost of test borings has been estimated based on sonic drilling methods for the most accurate characterization of the subsurface geology, other drilling methods could be less costly. If it is necessary to explore and fully test two areas, the portion of the above cost related to professional services (modeling, report, etc..) would not necessarily be doubled, due to efficiencies. Anticipating that exploration and testing would continue until well locations capable of producing the desired 6 to 8 mgd are identified, in our opinion it would be reasonable to assume for budgeting that the scope of work and cost may range from that described above ($220-255k) to double that amount.

Assuming that full access to all land is available at the start of work, the total program could be completed in approximately 3-4 months.

As specific parcels are identified it will be possible to make more precise estimates of the scope and cost of work. I hope this gives you what you need at this stage, let me know if you have any questions.

Sincerely,

Dan Haddock, P.E.
General Manager, Water Resources

WATER RESOURCES

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